Service Manual

ViewSonic EA771

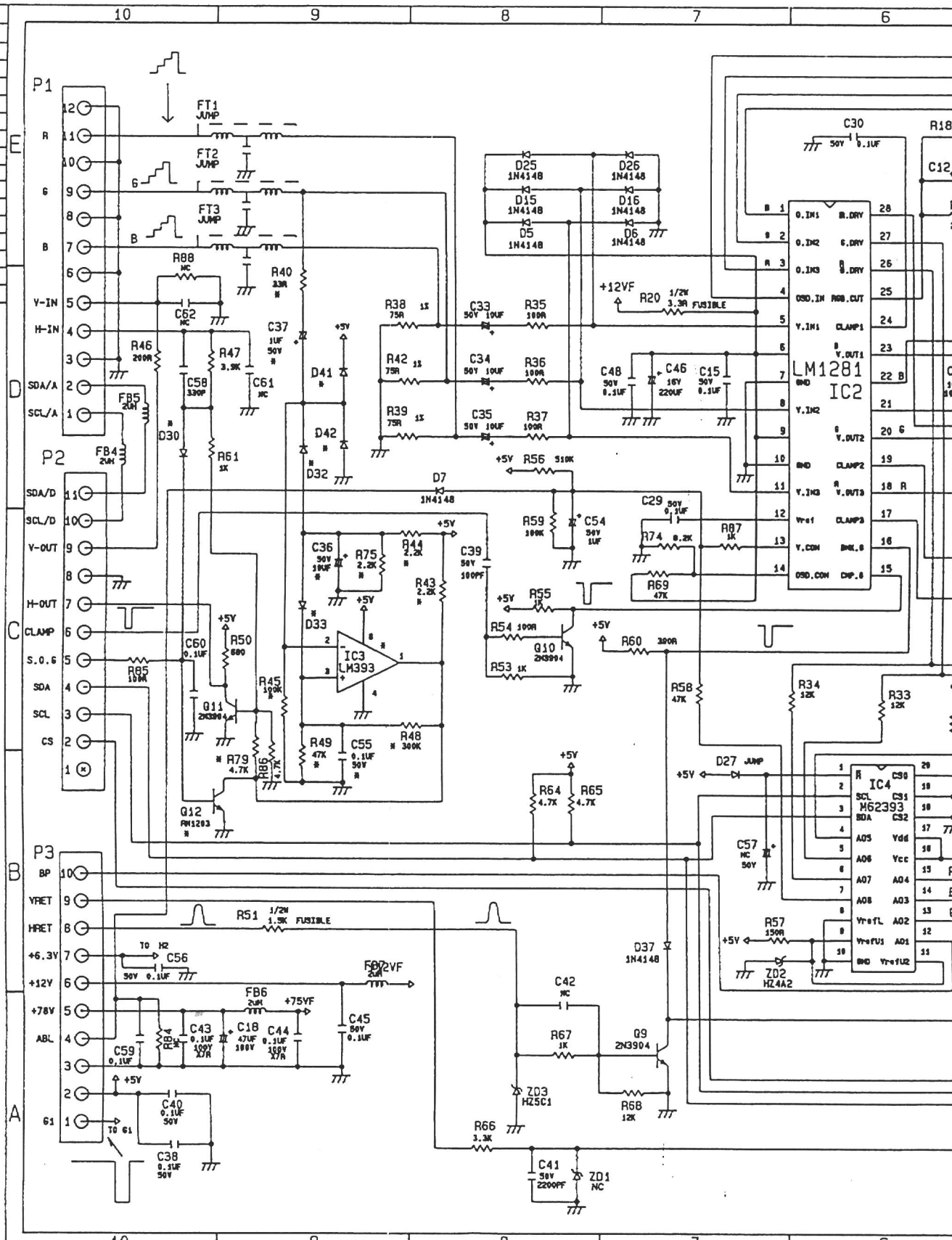
Model No. VCDTS21349-1

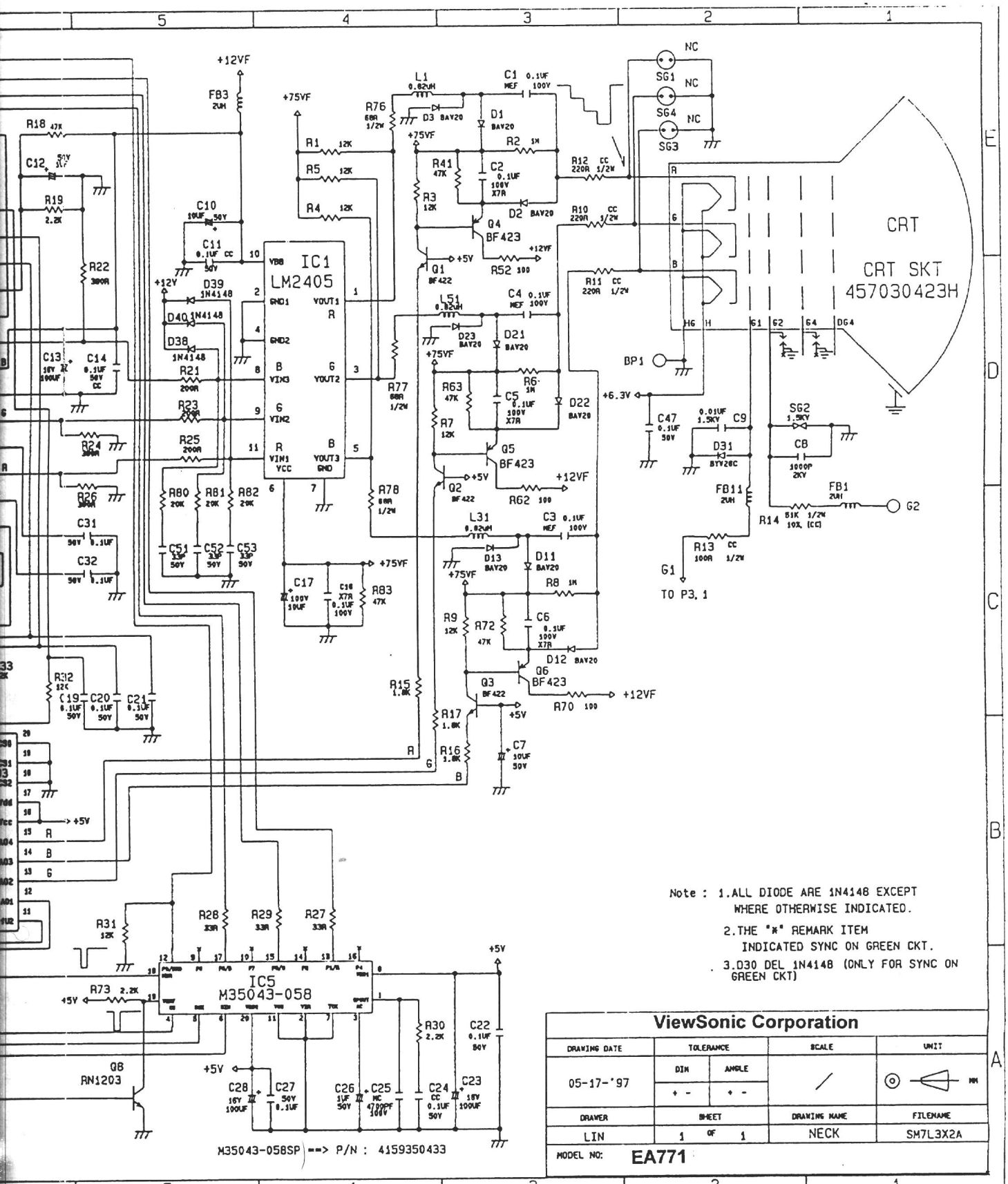
17" Digital Controlled Color Monitor
E^2 Series

(Rev. 1 - September 1997)

ViewSonic® 381 Brea Canyon Road, Walnut, California 91789 USA - (800) 888-8583

DATE	ECN/ECO NO.





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C5-15-'37	C-D41497C2EP
C6-02-'37	N-D6029701E6

	ON	STANDBY	SUSPEND OFF	MODE CHANGE
PMG0	HI	HI	LOW	HI
PMG1	LOW	HI	HI	⊓
PMG2	LOW	HI	HI	LOW
BLANKING	LOW	HI	HI	⊓

	MATSUSHITA	69K~53K	53K~42K	42K~34K
LOW ACTIVE	CS1	HI	LOW	HI
HI ACTIVE	CS2	LOW	LOW	HI
HI ACTIVE	CS0	HI	HI	HI

COME FROM NECK P2

P701

SDA 10
SCL 9
V-SYNC 8
GND 7
H-SYNC 6
CLAMP 5
SOG 4
SDA (1) 3
SCL (1) 2
CS (0) 1

R709 100R
R710 100R

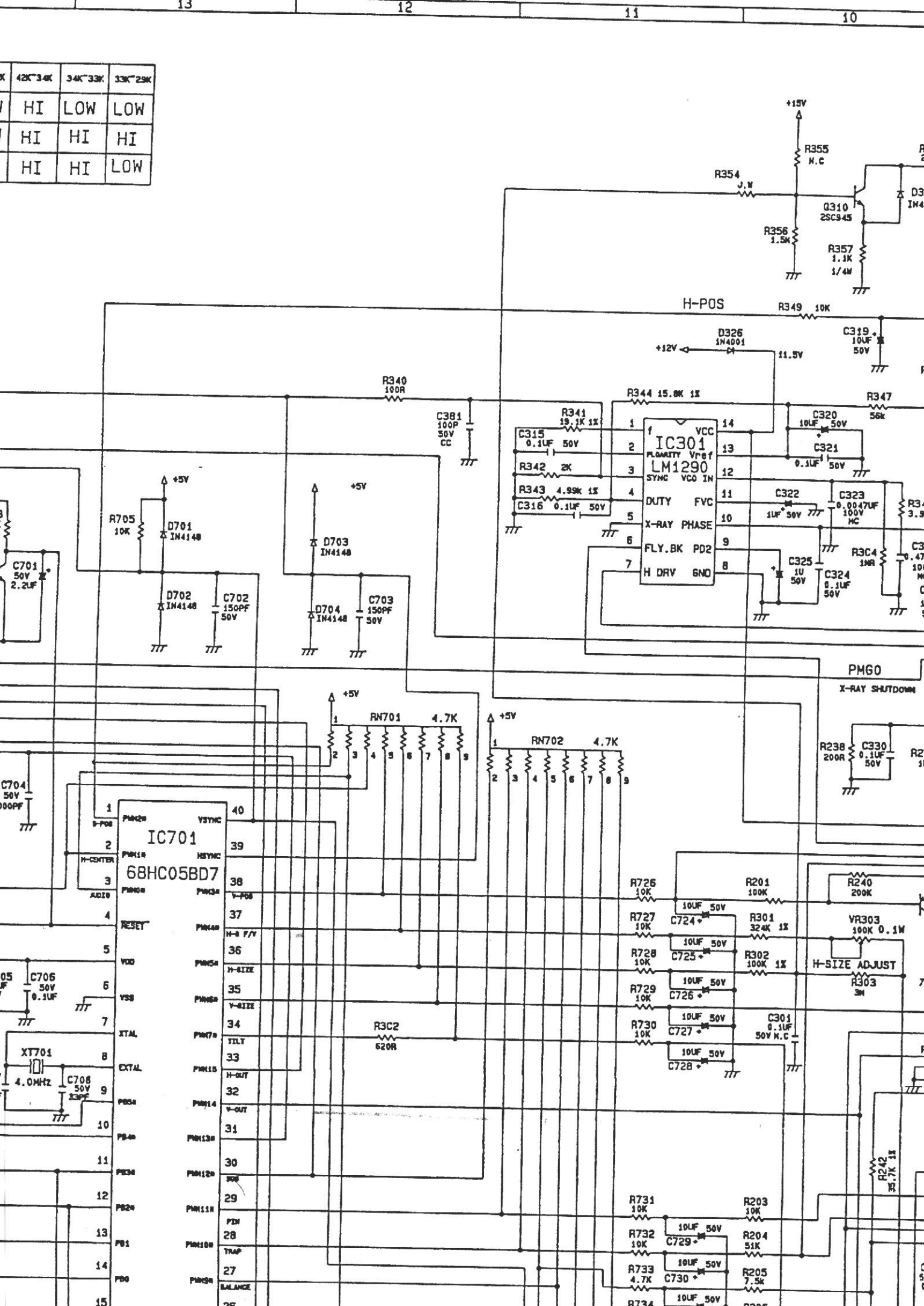
+5V
R701 200R
R703 4.7K
R702 4.7K
ZD701 MZ3C2
Q702 2SC945
C701 50V 2.2UF
Q701 2SC945
R704 200R

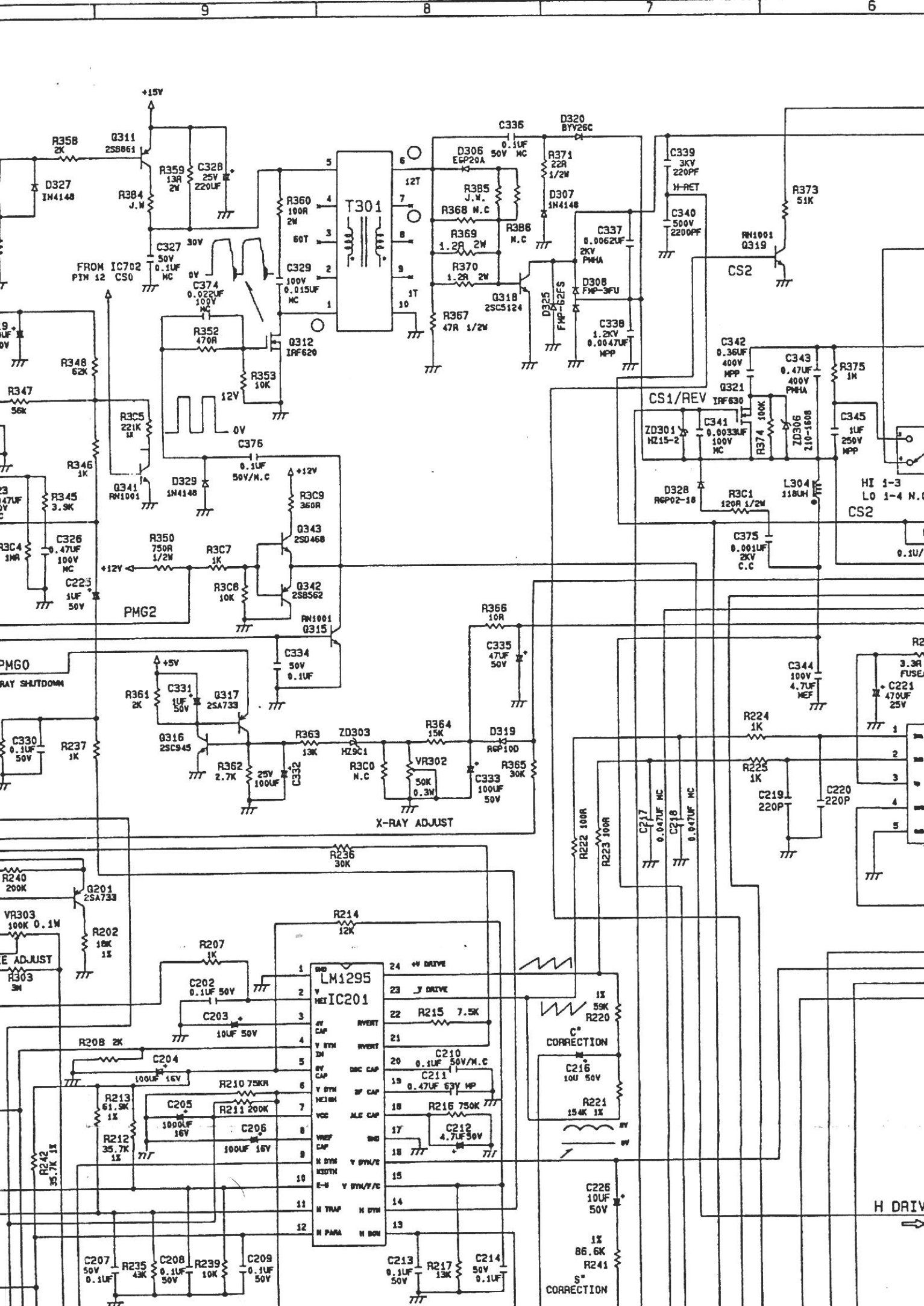
C704 50V 1000PF

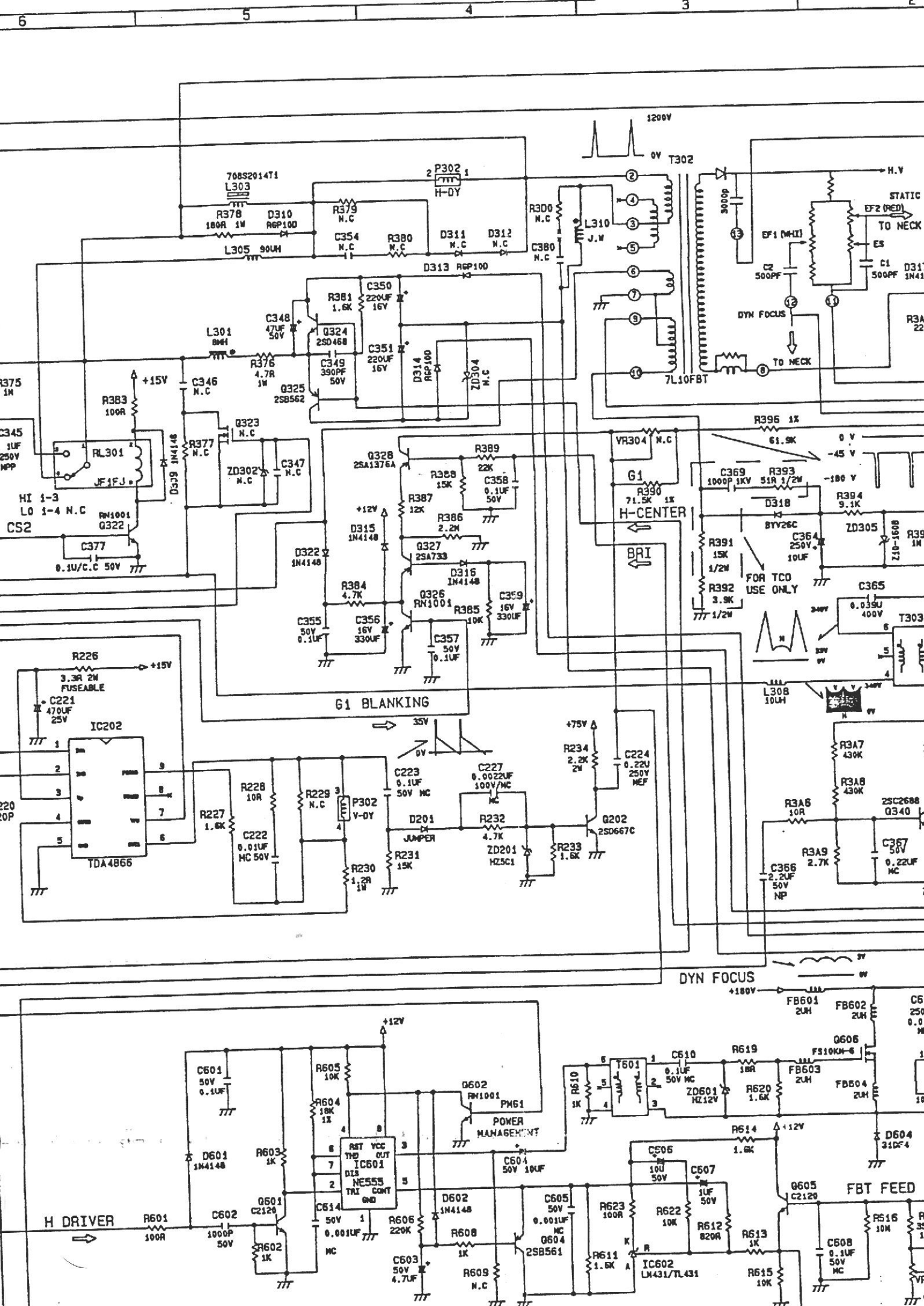
INSERT W/O AUDIO
R736 100R
N.C W/O AUDIO
Q705 2SC945
D716 1N4148
R711 620R

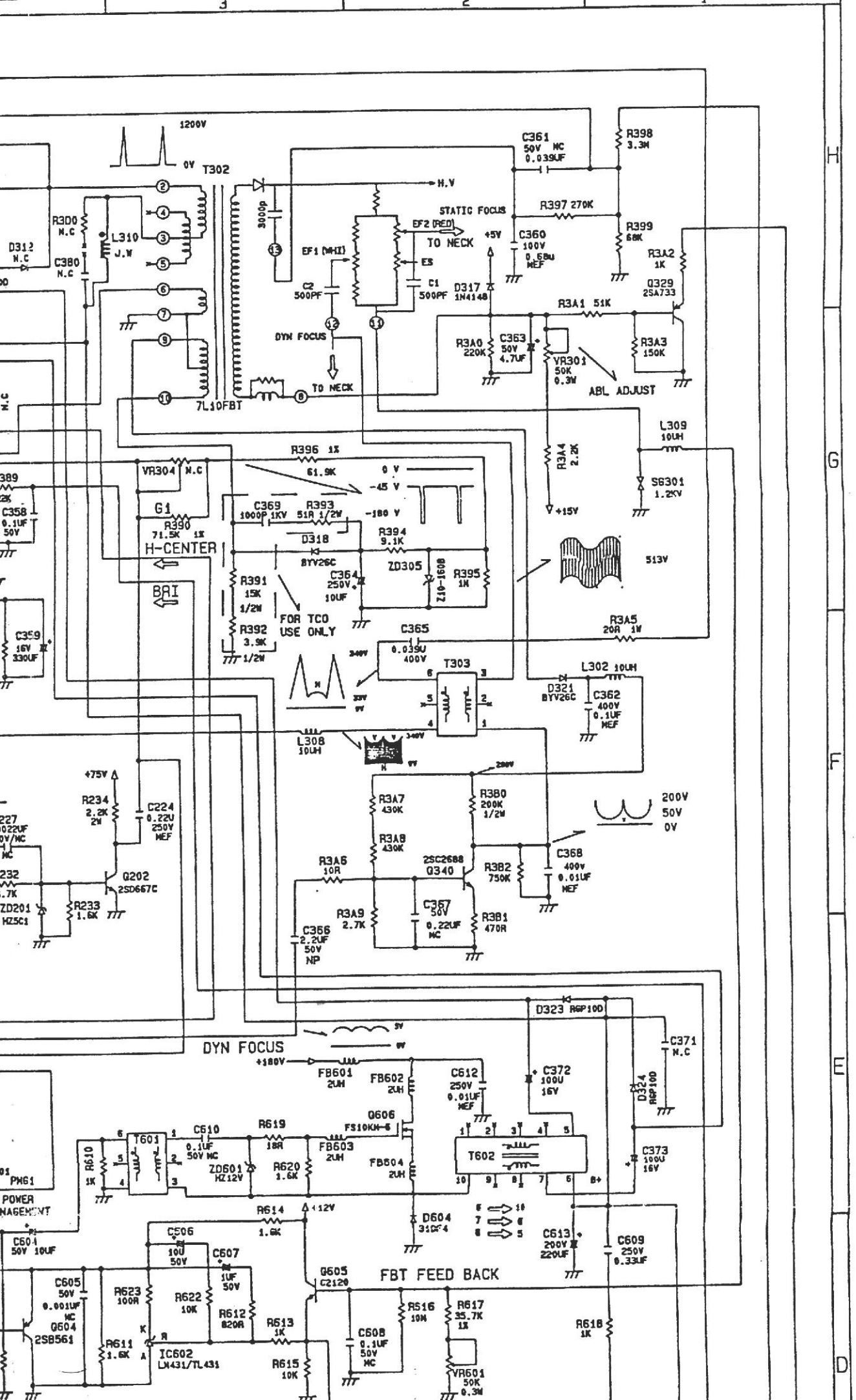
+5V
C705 100UF 10V
C70 50 0.1
RN703 4.7K
XT70
C707 50V 33PF
4.0MHz

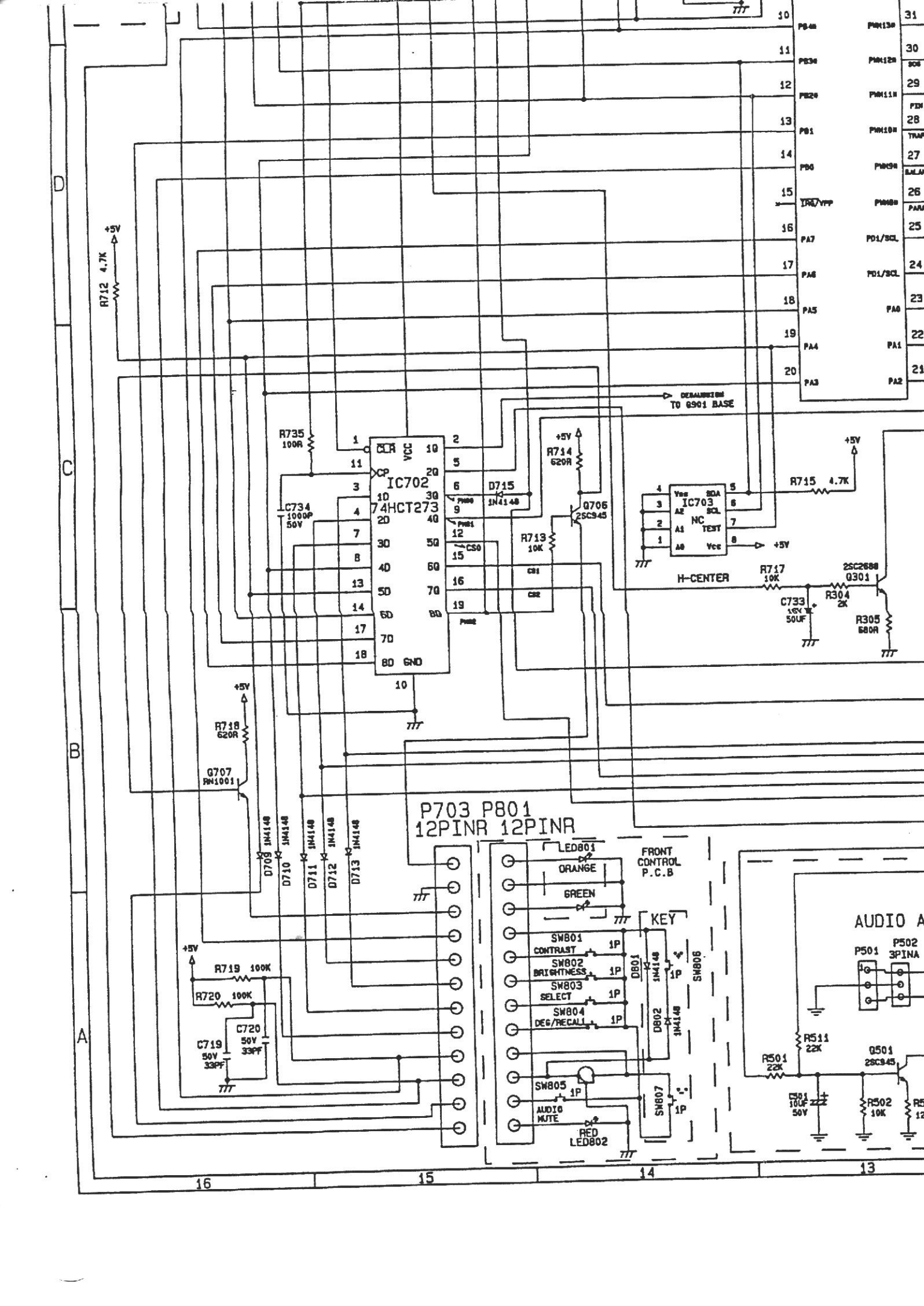
	42K~34K	34K~33K	33K~29K
	HI	LOW	LOW
	HI	HI	HI
	HI	HI	LOW

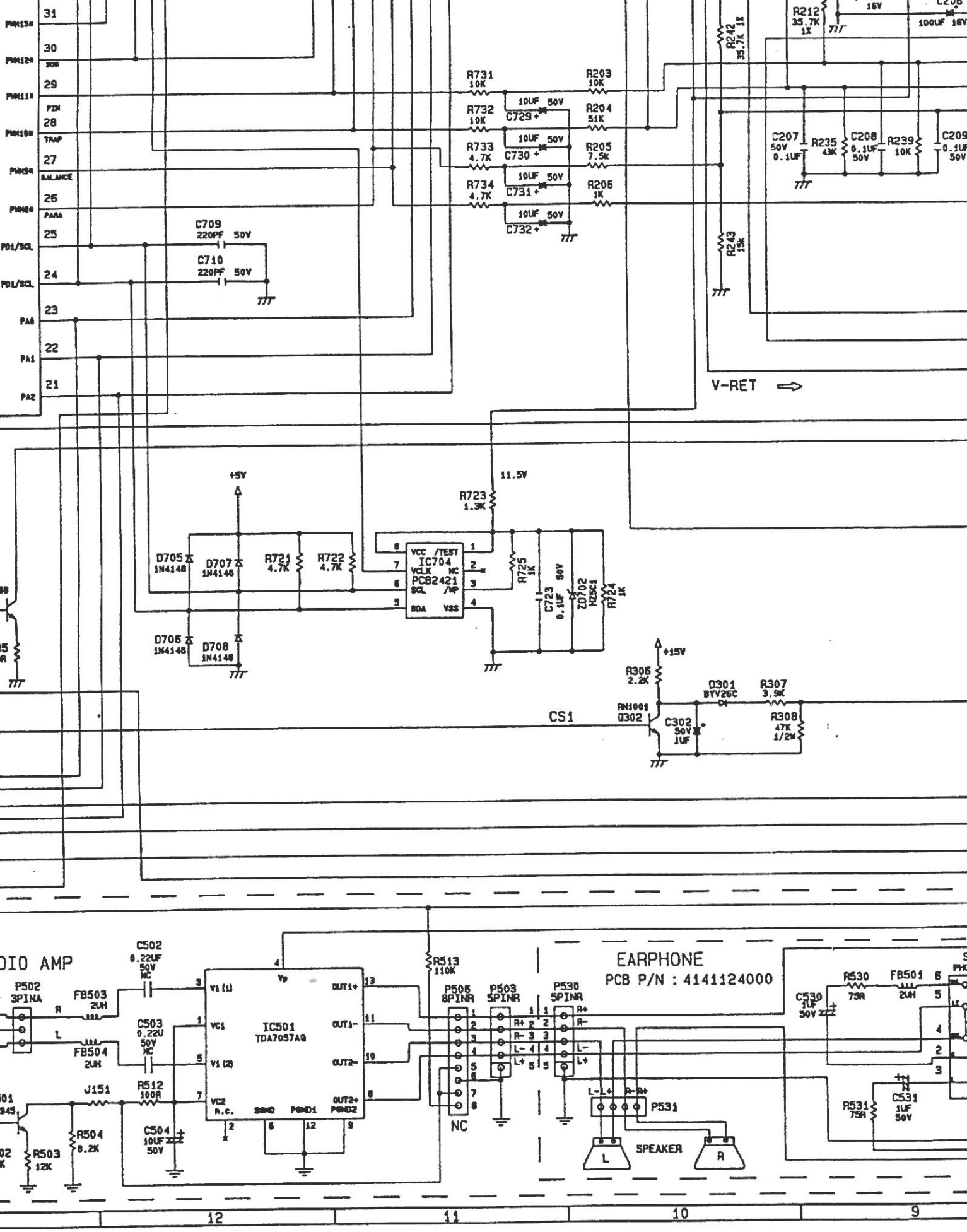



+15V
R358 2K
Q311 2SB861
D327 IN4148
R359 13R 2W
C328 25V 220UF
R384 J.W
C327 30V 50V 0.1UF MC
FROM IC702 PIN 12 CS0
0V
C374 0.022UF 100V MC
R352 470R
Q312 IRF620
R353 10K
12V
0V
R348 62K
R347 56K
R346 1K
R345 3.9K
R3C5 221K 1%
Q341 RN1001
D329 1N4148
C376 0.1UF 50V/M.C
R3C9 360R
Q343 2SD468
R350 750R 1/2W
R3C7 1K
R3C8 10K
Q342 2SB562
+12V
PMG2
C326 0.47UF 100V MC
C225 1UF 50V
R3C4 1MR
T301
R360 100R 2W
60T
C329 100V 0.015UF MC
5
6
12T
7
8
9
1T
10
4
3
2
1
D306 EGP20A 50V
C336 0.1UF MC
D320 BYV26C
R385 J.W.
R368 N.C
R369 1.2R 2W
R370 1.2R 2W
R386 N.C
R367 47R 1/2W
Q318 2SC5124
D325 FMP-62FS
D308 FMP-3FU
R371 22R 1/2W
D307 1N4148
C337 0.0062UF 2KV PMHA
C338 1.2KV 0.0047UF MPP
C339 3KV 220PF H-RET
C340 500V 2200PF
R373 51K
RN1001 Q319
CS2
C342 0.36UF 400V MPP
C343 0.47UF 400V PMHA
R375 1M
Q321 IRF630
CS1/REV
ZD301 HZ15-2
C341 0.0033UF 100V MC
R374 100K
ZD306 Z10-1608
C345 1UF 250V MPP
D328 RGP02-18
R3C1 120R 1/2W
L304 118UH
HI 1-3
LO 1-4 N.
CS2
C375 0.001UF 2KV C.C
0.1U/
PMG0
RAY SHUTDOWN
+5V
R361 2K
C331 1UF 50V
Q317 2SA733
Q316 2SC945
C330 0.1UF 50V
R237 1K
C334 50V 0.1UF
RN1001 Q315
R366 10R
C335 47UF 50V
R363 13K
ZD303 HZ9C1
R364 15K
D319 RGP10D
R362 2.7K 25V 100UF
C332
R3C0 N.C
VR302 50K 0.3W
R365 30K
C333 100UF 50V
X-RAY ADJUST
C344 100V 4.7UF MEF
R224 1K
R225 1K
C219 220P
C220 220P
C221 470UF 25V
R222 100R
R223 100R
C217 0.047UF MC
C218 0.047UF MC
R236 30K
R240 200K
Q201 2SA733
VR303 100K 0.1W
R202 18K 1%
E ADJUST
R303 3M
R214 12K
R207 1K
LM1295
IC201
C202 0.1UF 50V
C203 10UF 50V
R208 2K
C204 100UF 16V
R210 75KR
R213 61.9K 1%
C205 1000UF 16V
R211 200K
C206 100UF 16V
R212 35.7K 1%
R242 35.7K 1%
R215 7.5K
C210 0.1UF 50V/M.C
C211 0.47UF 63V MP
R216 750K
C212 4.7UF 50V
C207 50V 0.1UF
R235 43K
C208 0.1UF 50V
R239 10K
C209 0.1UF 50V
C213 0.1UF 50V
R217 13K
C214 50V 0.1UF
1% 59K R220
C* CORRECTION
C216 10U 50V
R221 154K 1%
C226 10UF 50V
1% 86.6K R241
S* CORRECTION
H DRIV

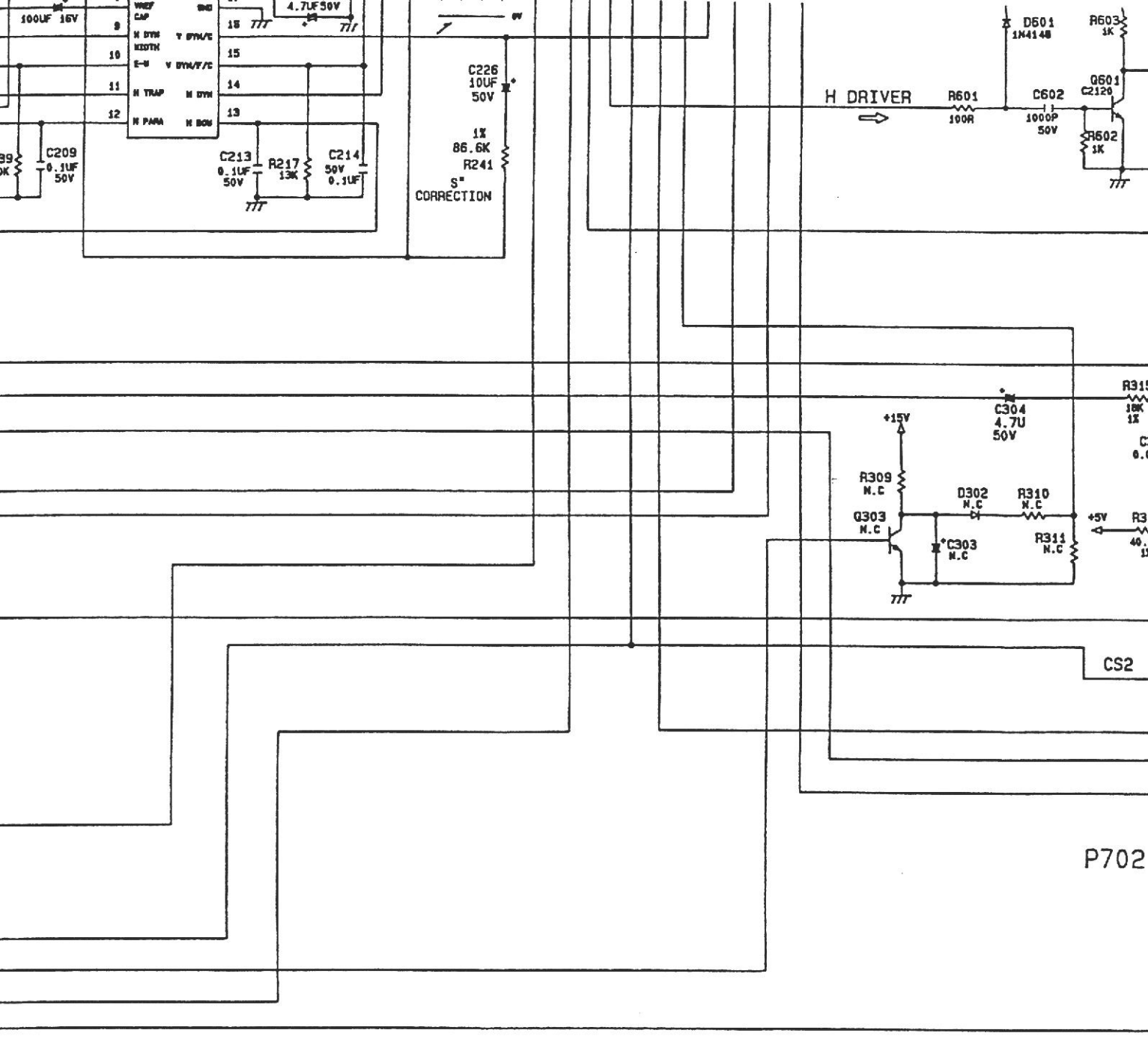

T302
7L10FBT
P302
H-DY
V-DY
L303
L305 90UH
L301
L310
L308
RL301
JF1FJ
HI 1-3
LO 1-4 N.C
CS2
+15V
+12V
+75V
+180V
H.V
STATIC
EF2 (RED)
TO NECK
EF1 (MHI)
ES
DYN FOCUS
FOR TCO USE ONLY
H-CENTER
BRI
G1
G1 BLANKING
DYN FOCUS
IC202
TDA4866
IC601
NE555
IC602
LM431/TL431
H DRIVER
FBT FEED
POWER MANAGEMENT
PM61
T601
Q328
2SA1376A
Q327
2SA733
Q326
RN1001
Q322
RN1001
Q324
2SD468
Q325
2SB562
Q323
N.C
Q329
2SC2120
Q601
C2120
Q602
RN1001
Q604
2SB561
Q605
C2120
Q606
FS10KM-6
Q202
2SD667C
Q340
2SC2688
D318
BYV26C
D315
1N4148
D316
1N4148
D322
1N4148
D314
RGP100
D313
RGP100
D310
RGP100
D311
N.C
D312
N.C
D339
1N4148
D601
1N4148
D602
1N4148
D604
31DF4
ZD302
N.C
ZD304
N.C
ZD305
ZD201
HZ5C1
ZD601
HZ12V
D201
JUMPER
L309
J.M
L310
J.M
R376
4.7R 1W
R377
N.C
R378
180R 1W
R379
N.C
R380
N.C
R381
1.6K
R383
100R
R384
4.7K
R385
10K
R386
2.2M
R387
12K
R388
15K
R389
22K
R390
71.5K 1%
R391
15K 1/2W
R392
3.9K 1/2W
R393
51R 1/2W
R394
9.1K
R395 1%
61.9K
R396 1%
R601
100R
R602
1K
R603
1K
R604
18K 1%
R605
10K
R606
220K
R608
1K
R609
N.C
R610
1K
R611
1.5K
R612
820R
R613
1K
R614
1.6K
R615
10K
R616
10M
R619
18R
R620
1.6K
R622
10K
R623
100R
R226
3.3R 2W FUSEABLE
R227
1.6K
R228
10R
R229
N.C
R230
1.2R 1W
R231
15K
R232
4.7K
R233
1.6K
R234
2.2K 2W
R3A5
10R
R3A6
10R
R3A7
430K
R3A8
430K
R3A9
2.7K
C221
470UF 25V
C222
0.01UF MC 50V
C223
0.1UF 50V MC
C224
0.22U 250V MEF
C227
0.0022UF 100V/MC
C345
1UF 250V MPP
C346
N.C
C347
N.C
C348
47UF 50V
C349
390PF 50V
C350
220UF 16V
C351
220UF 16V
C355
50V 0.1UF
C356
16V 330UF
C357
50V 0.1UF
C358
0.1UF 50V
C359
16V 330UF
C360
N.C
C361
3000P
C362
500PF
C363
500PF
C364
250V 10UF
C365
0.039U 400V
C366
2.2UF 50V NP
C367
50V 0.22UF MC
C369
1000P 1KV
C377
0.1U/C.C 50V
C501
50V 0.1UF
C502
50V 0.001UF MC
C503
50V 4.7UF
C504
50V 10UF
C505
50V 0.001UF MC
C506
10U 50V
C507
1UF 50V
C508
0.1UF 50V MC
C601
50V 0.1UF
C602
1000P 50V
C603
50V 4.7UF
C604
50V 10UF
C605
50V 0.001UF MC
C606
0.1UF 50V MC
C608
0.1UF 50V MC
C610
0.1UF 50V MC
C614
50V 0.001UF MC
FB601
2UH
FB602
2UH
FB603
2UH
FB604
2UH
L601
100UH
L602
100UH
VR304
N.C
RN1001
Q322
RN1001
Q326
RN1001
Q602
PM61
708S2014T1
L303
D339 1N4148
ZD304
N.C
RN1001
Q322
CS2
0.1U/C.C 50V
TO NECK
DYN FOCUS
FOR TCO USE ONLY
1200V
0V
-45 V
-180 V
35V
0V
+75V
+180V
+12V
+15V
3V
0V
T303
L308
10UH
R3A7
430K
R3A8
430K
R3A9
2.7K
R3A6
10R
Q340
2SC2688
C366
2.2UF 50V NP
C367
50V 0.22UF MC
R516
10M
C608
0.1UF 50V MC
R615
10K
R613
1K
R612
820R
R622
10K
R623
100R
C506
10U 50V
C507
1UF 50V
R614
1.6K
D604
31DF4
FB601
2UH
FB602
2UH
FB603
2UH
FB604
2UH
Q606
FS10KM-6
T601
C610
0.1UF 50V MC
R619
18R
R620
1.6K
ZD601
HZ12V
R610
1K
C602
1000P 50V
R602
1K
Q601
C2120
R606
220K
C603
50V 4.7UF
R608
1K
R609
N.C
C604
50V 10UF
C605
50V 0.001UF MC
Q604
2SB561
R611
1.5K
IC602
LM431/TL431
C614
50V 0.001UF MC
R604
18K 1%
R605
10K
R603
1K
C601
50V 0.1UF
D601
1N4148
Q602
RN1001
PM61
POWER MANAGEMENT
IC601
NE555
RST
VCC
THD
OUT
DIS
TRI
CONT
GND
D602
1N4148
Q605
C2120
FBT FEED
R516
10M
C608
0.1UF 50V MC
R615
10K
R613
1K
R612
820R
R622
10K
R623
100R
C506
10U 50V
C507
1UF 50V
R614
1.6K
D604
31DF4
FB601
2UH
FB602
2UH
FB603
2UH
FB604
2UH
Q606
FS10KM-6
T601
C610
0.1UF 50V MC
R619
18R
R620
1.6K
ZD601
HZ12V
R610
1K
C602
1000P 50V
R602
1K
Q601
C2120
R606
220K
C603
50V 4.7UF
R608
1K
R609
N.C
C604
50V 10UF
C605
50V 0.001UF MC
Q604
2SB561
R611
1.5K
IC602
LM431/TL431
C614
50V 0.001UF MC
R604
18K 1%
R605
10K
R603
1K
C601
50V 0.1UF
D601
1N4148
Q602
RN1001
PM61
POWER MANAGEMENT
IC601
NE555
D602
1N4148
Q605
C2120
FBT FEED
R516
10M
C608
0.1UF 50V MC
R615
10K
R613
1K
R612
820R
R622
10K
R623
100R
C506
10U 50V
C507
1UF 50V
R614
1.6K
D604
31DF4
FB601
2UH
FB602
2UH
FB603
2UH
FB604
2UH
Q606
FS10KM-6
T601
C610
0.1UF 50V MC
R619
18R
R620
1.6K
ZD601
HZ12V
R610
1K
C602
1000P 50V
R602
1K
Q601
C2120
R606
220K
C603
50V 4.7UF
R608
1K
R609
N.C
C604
50V 10UF
C605
50V 0.001UF MC
Q604
2SB561
R611
1.5K
IC602
LM431/TL431
C614
50V 0.001UF MC
R604
18K 1%
R605
10K
R603
1K
C601
50V 0.1UF
D601
1N4148
Q602
RN1001
PM61
POWER MANAGEMENT
IC601
NE555
D602
1N4148
Q605
C2120
FBT FEED

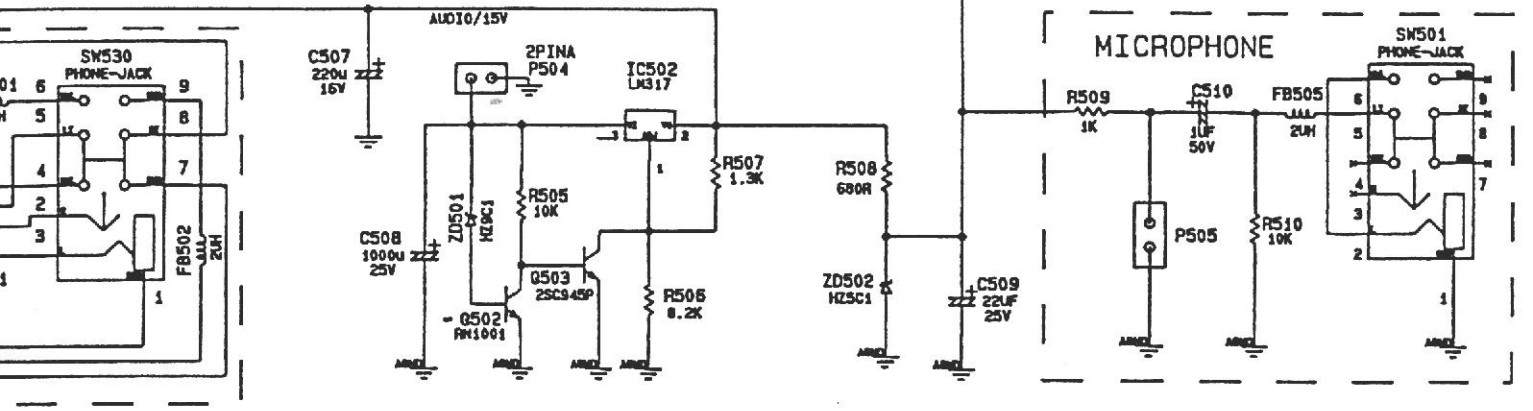

T302
7L10FBT
L310
J.W
R300
N.C
C380
N.C
D312
N.C
H.V
STATIC FOCUS
EF2 (RED)
TO NECK
EF1 (WHI)
ES
C1
500PF
C2
500PF
D317
1N4148
C360
100V
0.68U
MEF
C361
50V MC
0.039UF
R398
3.3M
R397 270K
R399
68K
R3A2
1K
Q329
2SA733
R3A1 51K
R3A0
220K
C363
50V
4.7UF
VR301
50K
0.3W
R3A3
150K
ABL ADJUST
DYN FOCUS
TO NECK
L309
10UH
R3A4
2.2K
+15V
S8301
1.25V
VR304 N.C
R396 1%
61.9K
0 V
-45 V
-180 V
G1
R390
71.5K 1%
H-CENTER
C369
1000P 1KV
R393
51R 1/2W
D318
BYV26C
R394
9.1K
ZD305
Z10-1608
R395
1M
513V
BRI
R391
15K
1/2W
R392
3.9K
1/2W
FOR TCO
USE ONLY
C364
250V
10UF
C365
0.039U
400V
R3A5
20R 1W
T303
L302 10UH
D321
BYV26C
C362
400V
0.1UF
MEF
L308
10UH
+75V
R234
2.2K
2W
C224
0.22U
250V
MEF
Q202
2SD667C
R233
1.6K
ZD201
HZ5C1
R3A7
430K
R380
200K
1/2W
R3A8
430K
200V
50V
0V
R3A6
10R
2SC2688
Q340
R382
750K
C368
400V
0.01UF
MEF
C367
50V
0.22UF
MC
R3A9
2.7K
R381
470R
C366
2.2UF
50V
NP
D323 RGP10D
DYN FOCUS
+180V
FB601
2UH
FB602
2UH
C612
250V
0.01UF
MEF
C372
100U
16V
D324
RGP10D
C371
N.C
Q606
FS10KM-6
T601
T602
C610
0.1UF
50V MC
R619
18R
FB603
2UH
FB604
2UH
R610
1K
ZD601
HZ12V
R620
1.6K
C373
100U
16V
B+
PM61
POWER
MANAGEMENT
R614
1.6K
+12V
D604
31DF4
C606
10U
50V
C607
1UF
50V
C604
50V 10UF
C609
250V
0.33UF
C613
200V
220UF
Q605
C2120
FBT FEED BACK
C605
50V
0.001UF
MC
Q604
2SB561
R623
100R
R622
10K
R612
820R
R613
1K
R611
1.6K
IC602
LM431/TL431
R615
10K
C608
0.1UF
50V
MC
R516
10M
R617
35.7K
1%
VR601
50K
0.3W
R618
1K


R712 4.7K
+5V
R735 100R
IC702
74HCT273
C734 1000P 50V
D715 1N4148
R714 620R
Q706 2SC945
R713 10K
TO Q901 BASE
IC703
NC
H-CENTER
R715 4.7K
R717 10K
Q301 2SC2688
R304 2K
C733 50UF
R305 680R
R718 620R
Q707 RN1001
D709 1N4148
D710 1N4148
D711 1N4148
D712 1N4148
D713 1N4148
P703 P801
12PINR 12PINR
FRONT CONTROL P.C.B
LED801
ORANGE
GREEN
KEY
SW801 CONTRAST 1P
SW802 BRIGHTNESS 1P
SW803 SELECT 1P
SW804 DEG/RECALL 1P
SW805 1P
AUDIO MUTE
RED LED802
D801 1N4148
D802 1N4148
SW806 1P
SW807 1P
R719 100K
R720 100K
C719 50V 33PF
C720 50V 33PF
AUDIO A
P501
P502 3PINA
R511 22K
R501 22K
Q501 2SC945
C501 10UF 50V
R502 10K
A
B
C
D
16
15
14
13


R731 10K
R732 10K
R733 4.7K
R734 4.7K
R203 10K
R204 51K
R205 7.5K
R206 1K
C729 10UF 50V
C730 10UF 50V
C731 10UF 50V
C732 10UF 50V
C709 220PF 50V
C710 220PF 50V
R212 35.7K 1%
R242 35.7K 1%
C207 50V 0.1UF
R235 43K
C208 0.1UF 50V
R239 10K
R243 15K
V-RET
+5V
11.5V
R723 1.3K
D705 1N4148
D707 1N4148
D706 1N4148
D708 1N4148
R721 4.7K
R722 4.7K
IC704 PCB2421
R725 1K
C723 0.1UF 50V
ZD702 MZ5C1
R724 1K
+15V
R306 2.2K
D301 BYV26C
R307 3.9K
R308 47K 1/2W
Q302
C302 50V 1UF
CS1
C502 0.22UF 50V
C503 0.22U 50V
FB503 2UH
FB504 2UH
IC501 TDA7057AQ
R513 110K
P506 8PINA
P503 5PINA
P530 5PINA
P502 3PINA
J151
R512 100R
C504 10UF 50V
R504 8.2K
R503 12K
NC
EARPHONE
PCB P/N : 4141124000
R530 75R
FB501 2UH
C530 1UF 50V
R531 75R
C531 1UF 50V
P531
SPEAKER
L
R

12 | 11 | 10 | 9





9 | 8 | 7 | 6 | 5

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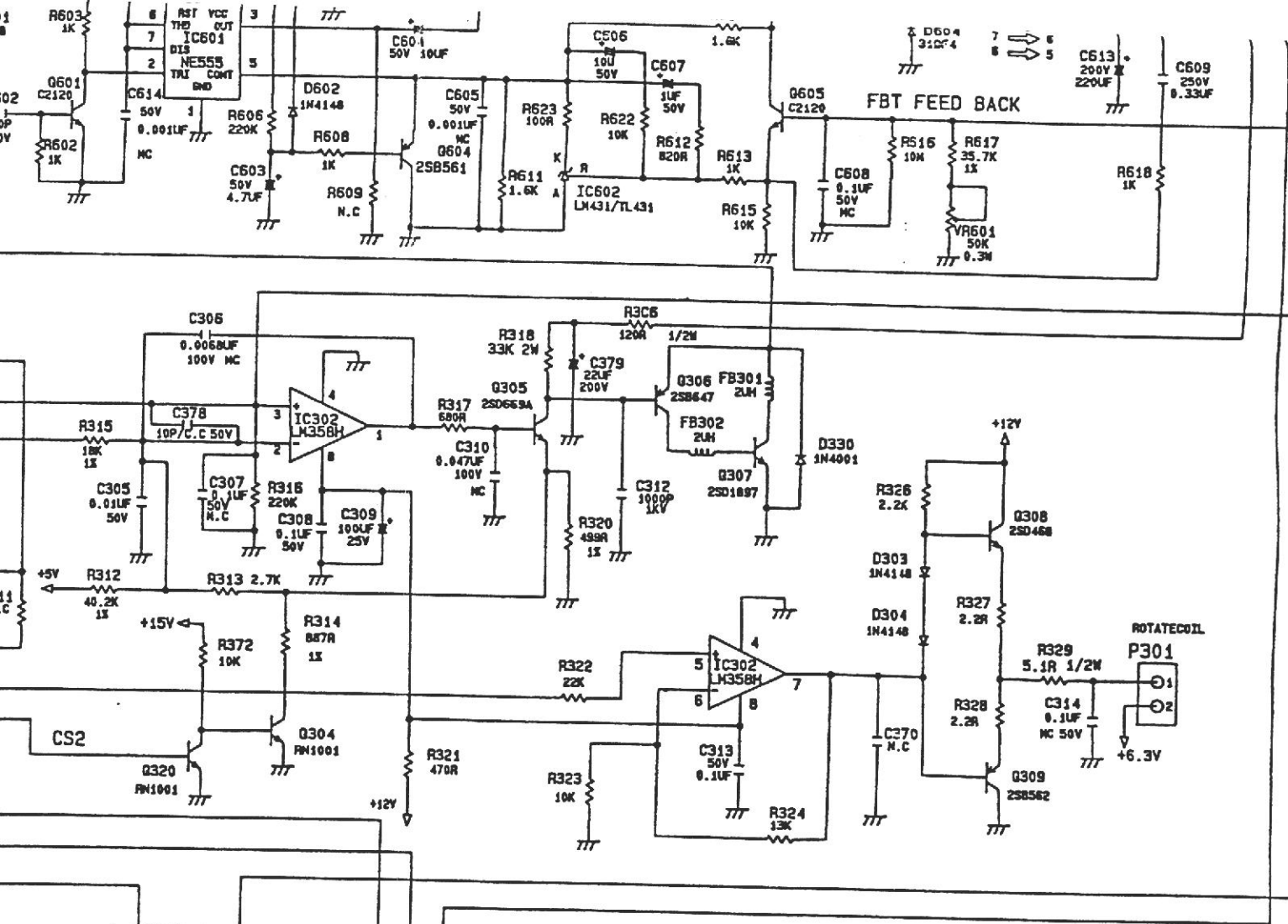

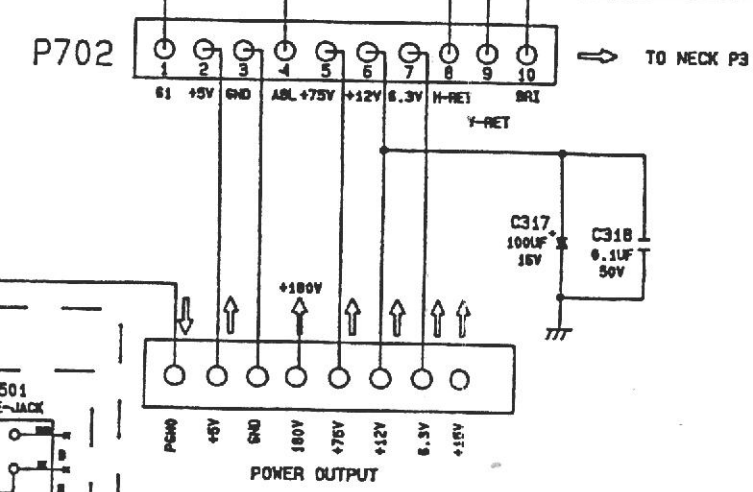

REMARK :

1. USED MATSUSHITA CRT M41KXH100X02(Q)
2. ALL 1/4W RESISTOR IS SMALL TYPE.

ViewSonic Corporation			
DRAWING DATE	TOLERANCE		SCALE
06-02-'97	XXX	ANGLE	/
	+ -	+ -	
DRAWER	SHEET		DRAWING NAME
LIN	1 OF 1		DEF
MODEL NO: EA771			

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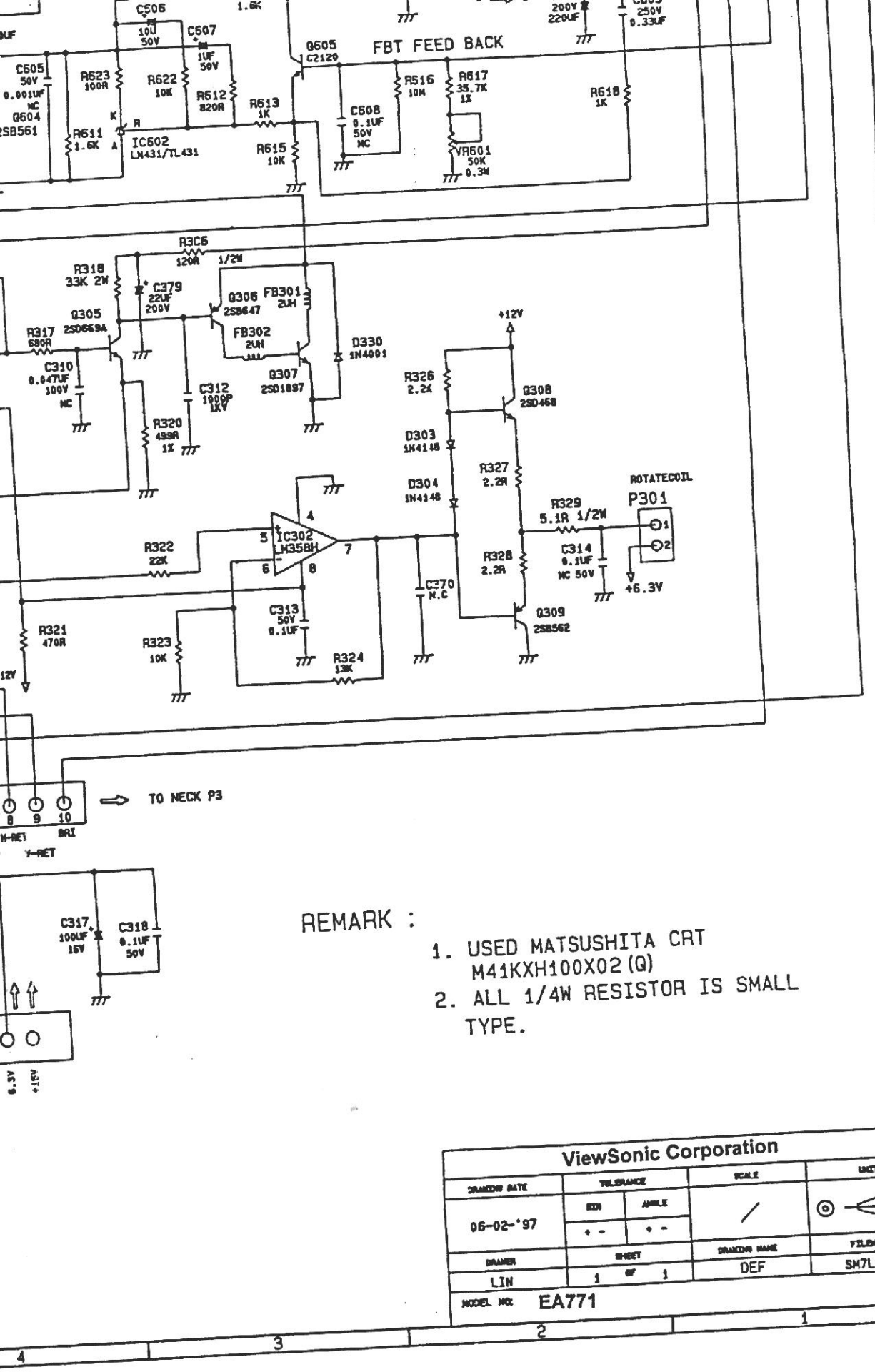

REMARK :

1. USED MATSUSHITA CRT M41KXH100X02(Q)
2. ALL 1/4W RESISTOR IS SMALL TYPE.

ViewSonic Corporation				
DRAWING DATE	TOLERANCE		SCALE	UNIT
06-02-'97	XXX	ANGLE	/	MM
	+ -	+ -		
DRAWER	SHEET		DRAWING NAME	FILENAME
LIN	1 OF 1		DEF	SM7L3X1A
MODEL NO: EA771				

Section 8.
Mechanical Parts

8.1. Exploded View. 8-1
8.2. Key to Exploded View 8-2

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8.1. Exploded View

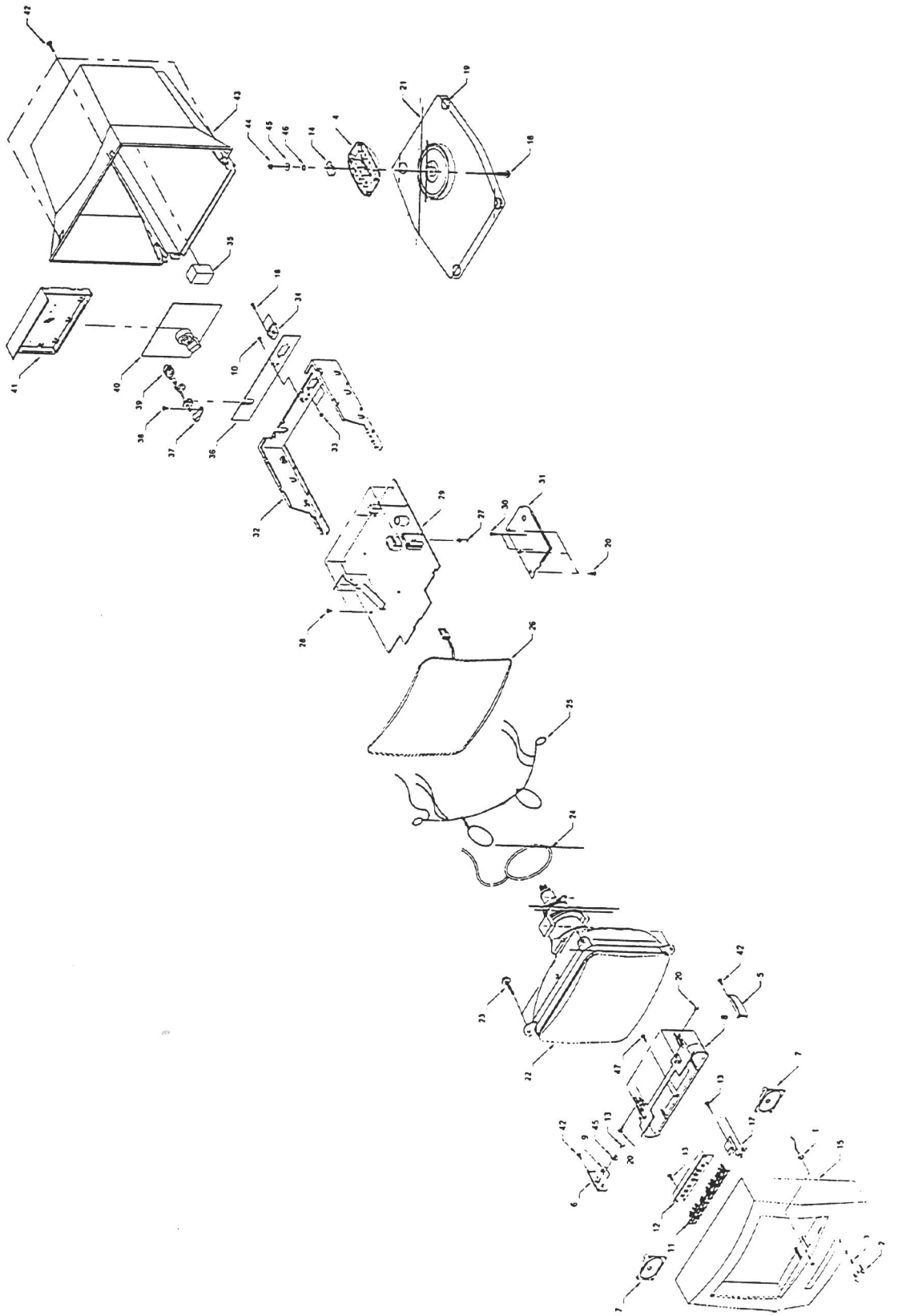

Figure 8-1 Exploded View

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8.2. Key to Exploded View

REF.	PART NO.	DESCRIPTION
1	SS7L301020-404	MICROPHONE & WIRE ASS'Y
2	1PA70K7L32	#POWER KNOB
3	2011097H10	POWER SPRING
4	1H040K7F10	#TILT BALL
5	1P690K7L32	#HOLDER (R)
6	1P700K7L32	#HOLDER (L)
7	4001122018	#SPEAKER 2W 8R 1.5" EP074001-0
8	1P710K7L32	#SPEAKER CHASSIS
9	SS7L320320-404	EARPHONE PCB ASS'Y
10	8418113008	SCREW B/HD M3X8 TAPPING "P" FOR RCA JACK & U BKT X1
11	1PAK0K7L32	#PIANO KEY
12	SS7L320420-404	CONTROL PCB ASS'Y
13	8418113010	SCREW BIND(+) TAPPING M3X10 ZI FOR CON.PANEL & PCB X4,SW & BEZEL ASS'Y X2,SP.CHAS
14	1AI00C7F10	RETAINER
15	1P010K7L32	#BEZEL
16	8004114025	SCREW BIND (+) ZINC M4X25 FOR BASE & RETAINER
17	4410202006	POWER SWITCH SS-160-7D SPST FOR SW901
18	8504113010	SCREW BIND(+) M3X10 MACH W/DIS FOR FILTER & U BKT X2,SW & BEZEL ASS'Y
19	1010094310	FOOT
20	8026113008	SCREW B/HD M3X8 TAPPING "B" FOR BTM SHIELD & U-BKT X3,U-BKT & BZL X2
21	1H050K7L32	#BASE
22	7010027617	CRT M41KXH100X02-Q MATSUSHITA CRT
23	8514115025	SCREW PAN(+) TAPPING M5X25 W/L FOR CRT & BEZEL
24	C460670110	TILT RING WIRE ASS'Y 270mm
25	C001137L10	CRT BRAID WIRE ASS'Y
26	7020177L32	DEGAUSSING COIL
27	36523BS19P	SPACER SUPPORT CBS-19P FOR MAIN PCB
28	8127113006	SCREW PAN(+)/HD CAP TAPPING M3X6 FOR U-BKT & MAIN PCB X7
29	SM7L325044-V	MAIN PCB ASS'Y
30	36523LSC12	SPACER SUPPORT (LSC-12) FOR BOTTOM SHIELD
31	2003097L32	#BOTTOM SHIELD
32	2001197H10	U BRACKET (I/C CABLE)
33	3011100030	NUT ISO HEX M3 Z1NC FOR LINE FILTER
34	7067F20122	LINE FILTER IX-0342-P FOR P901
35	9006095G21	SPONGE
36	9004097K21	DECO PLATE
37	2017094030	GROUND CLAMP
38	8121114008	SCREW CAP BID(+) M4X8 TAPPING FOR I/O CABLE CLIP
39	C7107L1210	I/O CABLE ASS'Y 1.8M
40	SM7L320244-V	NECK PCB ASS'Y
41	2007097L10	#NECK SHIELD
42	8418114016	SCREW B D(+) TRI "P" M4X16 FOR BEZEL & BUCKET X4,HOLDER & BEZEL X2
43	1P020K7L32	#BUCKET
44	3011100040	NUT M4 ZN3C FOR BASE & RETAINER
45	3111401210	WASHER FLAT #8O D=12 T=1 ZINC FOR BASE & RETAINER
46	2002094383	WASHER SPRING WAVE FOR BASE & RETAINER
47	8418143510	SCREW B/HD M3.5X10 TAPPING "P" ND(+) ZNC

Other parts list

REF.	PART NO.	DESCRIPTION
	1414002H22	LENS
	36723CH056	DEGAUSSING COIL CLIP FOR DEGAUSSING COIL & CRT
	463310000N	AC POWER CORD WALL 6FT GRY UL FOR SMS-7L32
	463110000n	AC POWER CORD PC VDE GRY 6FT FOR SMS-7L33
	5290005000	TUBE-SHRINK ID=5c FOR SW901
	5530200102	CORD CRAMPER TH-A FOR IC1
	5541025095	CABLE TIE 2.5X90 FOR TCO X12, CONN 12P WIRE X3
	5541025160	CABLE TIE-BINDING 2.5X160
	5541025160	CABLE TIE-BINDING 2.5X160 FOR YOKE 4P WIRE & FBT COVER X1, CONN10 PIN WIRE X1
	9002097G1B	LOGO
	9012097L32	MANUAL
	C4595G1111	GND WIRE ASS'Y
	C4597F1011	GND WIRE ASS'Y FOR U-BKT TO VIDEO SHIELD
	C488010031	AUDIO CABLE ASS'Y 6FT
	C488010040	MIC-PHONE CABLE ASS'Y
	C488030223	CONN. 3P & WIRE ASS'Y 500m.m FOR P904
	C488040105	CONN. 4P & WIRE ASS'Y 2.5mm FOR P531 TO SPK

Section 9.
PCB Component List

9.1. Explanation of Parts Listing 9-1
9.2. Main Board 9-1
9.3. Neck Board 9-7
9.4. Earphone Board 9-8
9.5. Control Board 9-8

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9.1. Explanation of Parts Listing

This section contains a complete listing of the components used on the printed circuit boards contained in the system. For a listing of the mechanical parts, please refer to Section 8., Mechanical Parts.

The list of parts in this section is separated by PCB, and the order of the listing is based on the location reference (REF.) printed on the circuit board and shown in the schematics. Components without a reference location are listed at the beginning of each table in order of the part number, and the location reference of the part with which they are connected is given in the description.

For example:

	2003097301	HEAT SINK FOR Q1

shows Part No. 2003097301, which is connected or related to the components with a location reference of Q1.

Shaded items indicate comonents that are critical for safety or are of proprietary design and must be replaced with parts of the exact same specification or ordered directly from the manufacturer.

For example:

Q1	4101515070	TRS. MOSFET 2SK1507 TO-220

Indicates that the TRS. MOSFET, Part No. 4101515070 located at reference Q1, should onlybe replaced with the exact same part ordered from the manufacturer.

9.2. Main Board

REF.	PART NO.	DESCRIPTION
	SM7L325044 -V	MAIN PCB ASS'Y
	2000000011	CLIP WIRE FOR IC202
	2003097301	HEAT SINK FOR Q905
	2004097K10	HEAT SINK FOR IC501
	2004191630	HEAT SINK HOLDER FOR Q906
	2004197L10	#HEAT SINK FOR IC202
	2005397T10	#FBT COVER FOR T302
	2008283080	HEAT SINK FOR D918
	2046294000	HEAT SINK F FOR IC502
	2046294000	HEAT SINK F FOR Q606
	3011100030	NUT ISO HEX M3 Z1NC FOR IC202
	3340101525	BEAD PIN 1.5¢ L=25 FOR R370
	3340236015	#BEAD P.N 16.5X2.35mm
	3340236015	#BEAD P.N 16.5X2.35mm
	36823TA103	WIRE HOLDER TA10-35 FOR MAIN PCB
	4141119003	#P.C.B. MA'N
	469230000*	CLIP-FUSE 5MM FOR F901
	5106122204	SPARK GAP 1.2KV AG-15 P:5mm -R
	5316201104	WIRE UL1007 #18 BLK 100-TERM 1 FOR Y-Y'
	5324101800	WIRE UL 1007 #24 BLK 170-K-K FRO P504- TO P903-
	5324121800	WIRE UL1007 #24 RED 170-K-K FOR P504+ TO P903+
	5541025095	CABLE TIE 2.5X90
	5550195001	CLOTH FILM TAPE #19mm FOR FBT COVER(L=7CM X1)
	5560080003	CORE-FE 2643665802 FOR FOCUS, G2 WIRE
	8026113008	SCREW B/HD M3X8 TAPPING *B* FOR FBT COVER & PCB X2,BTM SHIELD & U-BKT X2
	8026113008	SCREW B/HD M3X8 TAPPING *B* FOR Q906 & PCB
	8127113006	SCREW PAN(+)/HD CAP TAPPING M3X6 FOR GND WIRE & FBT COVER
	8127113006	SCREW PAN(+)/HD CAP TAPPING M3X6 FOR U-BKT & MAIN PCB X7, VIDEO SHIELD & FBT COVER X
	8128142608	SCREW B/H W/CAP *B* 2.6X8 TITE
	8418113008	SCREW B/HD M3X8 TAPPING *P* FOR RCA JACK & U BKT X1
	8433113010	SCREW CAP BID(+) M3X10 TAPPING FOR FBT & PCB
	8504113008	SCREW BIND(+) M3X8 MACH W/DISK FOR D325
	8504113008	SCREW BIND(+) M3X8 MACH W/DISK FOR IC501
	8504113008	SCREW BIND(+) M3X8 MACH W/DISK FOR IC502
	8504113008	SCREW BIND(+) M3X8 MACH W/DISK FOR Q606
	8504113010	SCREW BIND(+) M3X10 MACH W/DIS FOR FILTER & U BKT X2
	8504113010	SCREW BIND(+) M3X10 MACH W/DIS FOR Q307,Q318,Q308
	8504113012	SCREW BIND(+) M3X12 MACH W/DIS FOR IC202
	8504113016	SCREW BID(+) MACH W/D ZINC M3X FOR Q906
	9011294230	LABEL 28KV
	C459460011	GND WIRE ASS'Y FOR FBT COVER
	C4597L1030	GND WIRE ASS'Y 2060
	C4607F4120	WIRE ASS'Y 300MM FOR BP1
	C488100028	CONN, 10P X2 & WIRE ASS'Y FOR P701,702 TO P2 & P3
SD901	4130400080	DIODE BRIDGE 4A/800V P:5.0MM
C202	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C203	5156100T50	CAP-EC6 10UFM 50V -RT-
C204	5156101T16	CAP-EC6 100UFM 16V -RT-
C205	5156102S16	CAP-EC6 1000UFM 16V -SF-
C206	5156101T16	CAP-EC6 100UFM 16V -RT-
C207	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C208	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C209	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C210	5116104150	CAP-MC 0.1UFK 50V -RT-
C211	5074474163	CAP-MEF 0.47UFK 63V -SF-
C212	5156479T50	CAP-EC6 4.7UFM 50V -RT-
C213	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C214	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C215	5156100T50	CAP-EC6 10UFM 50V -RT-
C217	5116473111	CAP-MC 0.047UFK 100V -RT-
C218	5116473111	CAP-MC 0.047UFK 100V -RT-
C219	5128221552	CAP-COSL 220PFJ 50V -RT-
C220	5128221552	CAP-COSL 220PFJ 50V -RT-
C221	515X471525	CAP-ECX 470UFM 25V -SF-
C222	5116103550	CAP-MC 0.01UFJ 50V -RT-
C223	5116104150	CAP-MC 0.1UFK 50V -RT-
C224	5074224102	CAP-MEF 0.22UFK 250V P:15MM -S
C225	5156109T50	CAP-EC6 1UFM 50V -RT-
C226	5156100T50	CAP-EC6 10UFM 50V -RT-
C227	5116222150	XXXCAP-MC +-10% 0.0022UF;50V -
C231	5116104150	CAP-MC 0.1UFK 50V -RT-

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REF.	PART NO.	DESCRIPTION
C302	5156109T50	CAP-EC6 1UFM 50V -RT-
C304	5156479T50	CAP-EC6 4.7UFM 50V -RT-
C305	5116103550	CAP-MC 0.01UFJ 50V -RT-
C306	5116682111	CAP-MC 6800PFK 100V -RT-
C307	5116104150	CAP-MC 0.1UFK 50V -RT-
C309	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C309	5156101T25	CAP-EC6 100UFM 25V -RT-
C310	5116473111	CAP-MC 0.047UFK 100V -RT-
C312	5101102132	CAP-CCB 1000PFK 1KV -RT-
C313	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C314	5116104150	CAP-MC 0.1UFK 50V -RT-
C315	5116104150	CAP-MC 0.1UFK 50V -RT-
C316	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C317	5156101T16	CAP-EC6 100UFM 16V -RT-
C318	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C319	5156100T50	CAP-EC6 10UFM 50V -RT-
C320	5156100T50	CAP-EC6 10UFM 50V -RT-
C321	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C322	5156109T50	CAP-EC6 1UFM 50V -RT-
C323	5116472111	CAP-MC 0.0047UFK 100V -RT-
C324	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C325	5156109T50	CAP-EC6 1UFM 50V -RT-
C326	5113474111	CAP-MC 0.47UFK 100V -SF-
C327	5116104150	CAP-MC 0.1UFK 50V -RT-
C328	5156221T25	CAP-EC6 220UFM 25V -RT-
C329	5116153111	CAP-MC 0.015UFK 100V -RT-
C330	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C331	5156109T50	CAP-EC6 1UFM 50V -RT-
C332	5156101T25	CAP-EC6 100UFM 25V -RT-
C333	5156101T50	CAP-EC6 100UFM 50V -RT-
C334	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C335	515X470T50	CAP-ECX 47UFM 50V -RT-
C336	5116104150	CAP-MC 0.1UFK 50V -RT-
C337	5190622593	CAP-MPP 0.0062UFJ 1.8KV P:20.0
C338	5190472533	CAP-MPP 0.0047UFJ 1.2KV P:15mm
C339	510H221193	CAP-CCR 220PFK 3KV P:7.5mm -SF
C340	5101222142	CAP-CCB 2200PFK 500V -RT-
C341	5116332111	CAP-MC 0.0033UFK 100V -RT-
C342	5190364543	CAP-MPP 0.36UFJ 400V P:25MM -S
C343	5195474543	CAP-PMA 0.47UFJ 400V -SF-
C344	5074475101	CAP-MEF 4.7UFK 100V P:27.5MM -
C345	5190105583	CAP-MPP 1.0UFJ 250V
C348	5156470T50	CAP-EC6 47UFM 50V -RT-
C349	5128391552	CAP-CCSL 390PFJ 50V -RT-
C350	5156221T16	CAP-EC6 220UFM 16V -RT-
C351	5156221T16	CAP-EC6 220UFM 16V -RT-
C355	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C355	5156331T16	CAP-EC6 330UFM 16V -RT-
C357	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C358	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C359	5156331T16	CAP-EC6 330UFM 16V -RT-
C360	5074684101	CAP-MEF 0.68UFK 100V -SF-
C361	5116393150	CAP-MC 0.039UFK 50V -RT-
C362	5074104104	CAP-MEF 0.1UFK 400V P:15MM -SF
C363	5156479T50	CAP-EC6 4.7UFM 50V -RT-
C364	5156100S03	CAP-EC6 10UFM 250V -SF-
C365	5190393543	CAP-MPP 0.039UFJ 400V P:10mm -
C365	5162229T50	CAP-NPEC 2.2UFM 50V -RT-
C367	5113224153	CAP-MC 0.22UFK 50V -SF-
C368	5074103104	CAP-MEF 0.01UFK 400V P:10.0MM

REF.	PART NO.	DESCRIPTION
C369	510H102132	CAP-CCR 1000PFK 1KV P:5mm -RT-
C372	515X101T16	CAP-ECX 100UFM 16V -RT-
C373	5156101T16	CAP-EC6 100UFM 16V -RT-
C374	5116223111	CAP-MC 0.022UFK 100V -RT-
C375	51011021C3	CAP-CCB 1000PFK 2KV P:10MM -SF
C376	5116104150	CAP-MC 0.1UFK 50V -RT-
C377	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C378	5121100552	CAP-CCCH 10PFJ 50V -RT-
C379	5156220S07	CAP-EC6 22UFM 200V 10X20MM -SF
C381	5121101552	CAP-CCCH 100PFJ 50V -RT-
C501	5156100T50	CAP-EC6 10UFM 50V -RT-
C502	5113224150	CAP-MC 0.22UFK 50V -SF-
C503	5113224150	CAP-MC 0.22UFK 50V -SF-
C504	5156100T50	CAP-EC6 10UFM 50V -RT-
C507	5156221T16	CAP-EC6 220UFM 16V -RT-
C508	5156102S25	CAP-EC6 1000UFM 25V -SF-
C509	5156220T25	CAP-EC6 22UFM 25V -RT-
C510	5156109T50	CAP-EC6 1UFM 50V -RT-
C601	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C602	5101102152	CAP-CCB 1000PFK 50V -RT-
C603	5156479T50	CAP-EC6 4.7UFM 50V -RT-
C604	5156100T50	CAP-EC6 10UFM 50V -RT-
C605	5116102650	CAP-MC 0.001UFG 50V -RT-
C606	5156100T50	CAP-EC6 10UFM 50V -RT-
C607	5156109T50	CAP-EC6 1UFM 50V -RT-
C608	5116104150	CAP-MC 0.1UFK 50V -RT-
C609	5074334102	CAP-MEF 0.33UFK 250V P:15mm -S
C610	5116104150	CAP-MC 0.1UFK 50V -RT-
C612	5074103102	CAP-MEF 0.01UFK 250V -SF-
C613	515X221S07	CAP-ECX 220UFM 200V -SF-
C614	5116102650	CAP-MC 0.001UFG 50V -RT-
C701	5152229T50	CAP-EC2 2.2UFM 50V -RT-
C702	5121151552	CAP-CCCH 150PFJ 50V -RT-
C703	5121151552	CAP-CCCH 150PFJ 50V -RT-
C704	5101102152	CAP-CCB 1000PFK 50V -RT-
C705	5152101T10	CAP-EC2 100UFM 10V 6X7mm -RT-
C706	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C707	5121330552	CAP-CCCH 33PFJ 50V -RT-
C708	5121330552	CAP-CCCH 33PFJ 50V -RT-
C709	5128221552	CAP-CCSL 220PFJ 50V -RT-
C710	5128221552	CAP-CCSL 220PFJ 50V -RT-
C719	5121330552	CAP-CCCH 33PFJ 50V -RT-
C720	5121330552	CAP-CCCH 33PFJ 50V -RT-
C723	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C724	5156100T50	CAP-EC6 10UFM 50V -RT-
C725	5156100T50	CAP-EC6 10UFM 50V -RT-
C726	5156100T50	CAP-EC6 10UFM 50V -RT-
C727	5156100T50	CAP-EC6 10UFM 50V -RT-
C728	5156100T50	CAP-EC6 10UFM 50V -RT-
C729	5156100T50	CAP-EC6 10UFM 50V -RT-
C730	5156100T50	CAP-EC6 10UFM 50V -RT-
C731	5156100T50	CAP-EC6 10UFM 50V -RT-
C732	5156100T50	CAP-EC6 10UFM 50V -RT-
C733	5156100T50	CAP-EC6 10UFM 50V -RT-
C734	5101102152	CAP-CCB 1000PFK 50V -RT-
C901	5067224425	CAP-MPR 0.22UFM 250V -SF-
C902	515P221S04	CAP-ECP 220UFM 400V 25 -SF-
C903	5074104506	CAP-MEF 0.1UFJ 630V P:15MM -SF
C904	5061472440	CAP-CCS 4700PFM 400V -SF-
C905	5061472440	CAP-CCS 4700PFM 400V -SF-

REF.	PART NO.	DESCRIPTION
C906	5062222425	CAP-CCS 2200PFM 250V P:10mm -S
C908	5156221T25	CAP-EC6 220UFM 25V -RT-
C909	5116102111	CAP-MC 0.001UFK 100V -RT-
C910	5156101T25	CAP-EC6 100UFM 25V -RT-
C911	5092103615	CAP-PP .01UFG 100V P:10mm -SF-
C912	5116103111	CAP-MC 0.01UFK 100V -RT-
C913	5075104163	CAP-MEF 0.1UFK 63V CF
C914	5128331552	CAP-CCSL 330PFJ 50V -RT-
C915	5075104163	CAP-MEF 0.1UFK 63V CF
C916	5156100S07	CAP-EC6 10UFM 200V -SF-
C918	510H221193	CAP-CCR 220PFK 3KV P:7.5mm -SF
C919	5101101132	CAP-CCB 100PFK 1KV -RT-
C920	515X151S02	CAP-ECX 150UFM 160V -SF-
C921	515X101S01	CAP-ECX 100UFM 100V -SF-
C922	515X339T50	CAP-ECX 3.3UFM 50V -RT-
C923	510H102132	CAP-CCR 1000PFK 1KV P:5mm -RT-
C924	515F471S25	CAP-ECF 470UFM 25V -SF-
C925	5075474505	CAP-MEF 0.47UFJ 50V -RT-
C926	515X102S16	CAP-ECX 1000UFM 16V -SF-
C928	515X102S25	CAP-ECX 1000UFM 25V -SF-
C929	515F221T25	CAP-ECF 220UFM 25V -RT-
C930	5074104101	CAP-MEF 0.1UFK 100V -SF-
C931	5128471552	CAP-CCSL 470PFJ 50V -RT-
C932	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C934	5101103152	CAP-CCB 0.01UFK 50V -RT-
C939	515X101T16	CAP-ECX 100UFM 16V -RT-
C942	5067104425	CAP-MPR 0.1UFM 250V -SF-
C945	5156101T16	CAP-EC6 100UFM 16V -RT-
C946	5156470T35	CAP-EC6 47UFM 35V -RT-
C947	5128331552	CAP-CCSL 330PFJ 50V -RT-
C948	5101103152	CAP-CCB 0.01UFK 50V -RT-
D301	413010426C	DIODE BYV26C KINK FORMING -AT-
D303	4120141480	DIODE 1N4148 (SI) -AT-
D304	4120141480	DIODE 1N4148 (SI) -AT-
D305	413020120A	DIODE EGP-20A -AT-
D307	4120141480	DIODE 1N4148 (SI) -AT-
D308	4130303F00	DIODE FMP-3FU TO-3PF
D309	4120141480	DIODE 1N4148 (SI) -AT-
D310	413010010D	DIODE RGP10D-5302 -AT- 1A
D313	413010010D	DIODE RGP10D-5302 -AT- 1A
D314	413010010D	DIODE RGP10D-5302 -AT- 1A
D315	4120141480	DIODE 1N4148 (SI) -AT-
D316	4120141480	DIODE 1N4148 (SI) -AT-
D317	4120141480	DIODE 1N4148 (SI) -AT-
D318	413010426C	DIODE BYV26C KINK FORMING -AT-
D319	4130100100	DIODE RGP10D-5302 -AT- 1A
D320	413010426C	DIODE BYV26C KINK FORMING -AT-
D321	413010426C	DIODE BYV26C KINK FORMING -AT-
D322	4120141480	DIODE 1N4148 (SI) -AT-
D323	4130100100	DIODE RGP10D-5302 -AT- 1A
D324	4130100100	DIODE RGP10D-5302 -AT- 1A
D325	413050025G	DIODE FMP-G2FS TO-220AB 1500V
D326	4120104001	DIODE 1N4001 -AT-
D327	4120141480	DIODE 1N4148 (SI) -AT-
D328	4130100218	DIODE RGP02-18E-5300 -AT-
D329	4120141480	DIODE 1N4148 (SI) -AT-
D330	4120104001	DIODE 1N4001 -AT-
D601	4120141480	DIODE 1N4148 (SI) -AT-
D602	4120141480	DIODE 1N4148 (SI) -AT-
D604	413030315F4	DIODE 3A/400V 35NS 31DF4 -AT-

REF.	PART NO.	DESCRIPTION
D701	4120141480	DIODE 1N4148 (SI) -AT-
D702	4120141480	DIODE 1N4148 (SI) -AT-
D703	4120141480	DIODE 1N4148 (SI) -AT-
D704	4120141480	DIODE 1N4148 (SI) -AT-
D705	4120141480	DIODE 1N4148 (SI) -AT-
D706	4120141480	DIODE 1N4148 (SI) -AT-
D707	4120141480	DIODE 1N4148 (SI) -AT-
D708	4120141480	DIODE 1N4148 (SI) -AT-
D709	4120141480	DIODE 1N4148 (SI) -AT-
D710	4120141480	DIODE 1N4148 (SI) -AT-
D711	4120141480	DIODE 1N4148 (SI) -AT-
D712	4120141480	DIODE 1N4148 (SI) -AT-
D713	4120141480	DIODE 1N4148 (SI) -AT-
D715	4120141480	DIODE 1N4148 (SI) -AT-
D716	4120141480	DIODE 1N4148 (SI) -AT-
D901	413010426C	DIODE BYV26C KINK FORMING -AT-
D902	413010426C	DIODE BYV26C KINK FORMING -AT-
D903	413010426E	DIODE BYV26E 1A/1000V SOD-57
D904	4120104001	DIODE 1N4001-AT-
D905	4120141480	DIODE 1N4148 (SI) -AT-
D906	4120141480	DIODE 1N4148 (SI) -AT-
D908	4120141480	DIODE 1N4148 (SI) -AT-
D909	4120141480	DIODE 1N4148 (SI) -AT-
D910	4120141480	DIODE 1N4148 (SI) -AT-
D911	4120141480	DIODE 1N4148 (SI) -AT-
D912	4120141480	DIODE 1N4148 (SI) -AT-
D914	413020426C	DIODE 2.3A/600V BYM26C -AT-
D915	413020426C	DIODE 2.3A/600V BYM26C -AT-
D916	41303031F6	DIODE 31DF6
D917	4120141480	DIODE 1N4148 (SI) -AT-
D918	41303031F2	DIODE 3A/200V 31DF2
D919	41303030F2	DIODE 30DF2
D920	413020120C	DIODE EGP20C-5390 -AT-
D921	4120104001	DIODE 1N4001 -AT-
D922	4120104001	DIODE 1N4001 -AT-
D925	41301011Q3	DIODE 11DQ03 -AT-
D926	4120141480	DIODE 1N4148 (SI) -AT-
F901	5268400052	FUSE 4A/250VAC
FB301	4322209005	FERRITE BEAD 2UH
FB302	4322209005	FERRITE BEAD 2UH
FB503	4322209005	FERRITE BEAD 2UH
FB504	4322209005	FERRITE BEAD 2UH
FB505	4322209005	FERRITE BEAD 2UH
FB601	4322209046	FERRITE BEAD 2UH -AT-
FB602	4322209046	FERRITE BEAD 2UH -AT-
FB603	4322209046	FERRITE BEAD 2UH -AT-
FB604	4322209046	FERRITE BEAD 2UH -AT-
FB901	4322209046	FERRITE BEAD 2UH -AT-
FB902	4322209046	FERRITE BEAD 2UH -AT-
FB903	4322209046	FERRITE BEAD 2UH -AT-
FB904	4322209005	FERRITE BEAD 2UH
FB905	4322209046	FERRITE BEAD 2UH -AT-
FB907	4322209046	FERRITE BEAD 2UH -AT-
FB910	4322209005	FERRITE BEAD 2UH
IC201	4159129500	IC LM1295 24PIN
IC202	4159486600	IC TDA4866 9PIN SIL9P
IC301	4159129000	IC LM1290
IC302	4159358000	IC LM358N 8PIN
IC501	4159705700	IC TDA7057AQ 13PIN SOT141-6
IC502	4159317001	IC LM317T W/MOUNTING KIT TO-22

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REF.	PART NO.	DESCRIPTION
IC601	4159555000	IC NE555 8PIN
IC602	415943100A	IC LM431ACE REGULATOR TO-92 -R
IC701	4159687072	#IC MASK 68HC705BD7P
IC702	4152742730	IC 74HCT273 20PIN
IC703	415924L160	IC 24LC16BP 8PIN DIP
IC704	4159242110	IC PCB2421 8PIN
IC901	4159384200	IC UC3842A 8PIN
IC902	415943100A	IC LM431ACE REGULATOR TO-92 -R
IC903	4159781201	IC MCT7812CT TO-220AB
IC904	4159780501	IC 7805 REGULATOR 3PIN
J125	4050547155	RES-CF 1/4W J 470R SMALL -AT-
L301	4323809503	COIL CHOKE 8mH
L302	4321100006	COIL PEAKING 10UH -AT-
L303	708S2014T1	COIL LINEARITY -SF-
L304	4325111403	CHOKE COIL 118uH (WINDING) -SF
L305	4323900103	COIL CHOKE 90UH -SF-
L308	4321100006	COIL PEAKING 10UH -AT-
L309	4321100006	COIL PEAKING 10UH -AT-
L901	4321100006	COIL PEAKING 10UH -AT-
L902	4323101503	COIL CHOKE 100uH -SF-
P301	4490200130	CONN. 2P WAFER 2.5MM
P302	4490400207	CONN. 4P WAFER ROUND PIN
P501	4490101020	AUDIO I/P RCA JACK 1020-2P
P505	4490200130	CONN. 2P WAFER 2.5MM
P530	4490500260	CONN. 5P 2.0mm 17393/-05
P703	4491200260	CONN. 12P TOP 2.0mm 1-173981-2
P902	4490200207	CONN. 2P WAFER ROUND PIN 10MM
P904	4490300190	CONN. 3.96 3P W/O PIN 2 -SF-
PH901	4159435002	POTO COUPLER X'STER 4N35 W=10
PTCR	7021174230	PTCR 14R
Q201	4110007330	TRS. 2SA733 TO-92M -RT-
Q202	411030667C	TRS. 2SD667C TO-92M -RT-
Q301	4100226880	TRS. 2SC2688 TO-126
Q302	4116610010	TRS. RN1001 -RT-
Q304	4116610010	TRS. RN1001 -RT-
Q305	410030669A	TRS. 2SD669AWC TO-126
Q306	411010647C	TRS. 2SB647C TO-92M -RT-
Q307	4100318970	TRS. 2SD1897 TO-220F
Q308	4110304680	TRS. 2SD468 TO-92M -RT-
Q309	4110105620	TRS. 2SB562 -RT-
Q310	411020945P	TRS. 2SC945P TO-92 -RT-
Q311	4100105510	TRS. 2SB861
Q312	4105906200	TRS. MOSFET IRF620 TO-220
Q315	4116610010	TRS. RN1001 -RT-
Q316	411020945P	TRS. 2SC945P TO-92 -RT-
Q317	4110007330	TRS. 2SA733 TO-92M -RT-
Q318	4100251240	TRS. 2SC5124 TO-3P
Q319	4116610010	TRS. RN1001 -RT-
Q320	4116610010	TRS. RN1001 -RT-
Q321	41035012K0	TRS. FS12KM-5 12A/250V TO-220
Q322	4116610010	TRS. RN1001 -RT-
Q324	4110304680	TRS. 2SD468 TO-92M -RT-
Q325	4110105620	TRS. 2SB562 -RT-
Q326	4116610010	TRS. RN1001 -RT-
Q327	4110007330	TRS. 2SA733 TO-92M -RT-
Q328	411001376A	TRS. 2SA1376A TO-92 -RT-
Q329	4110007330	TRS. 2SA733 TO-92M -RT-
Q340	4100226880	TRS. 2SC2688 TO-126
Q341	4116610010	TRS. RN1001 -RT-
Q342	4110105620	TRS. 2SB562 -RT-

REF.	PART NO.	DESCRIPTION
Q343	4110304680	TRS. 2SD468 TO-92M -RT-
Q501	411020945P	TRS. 2SC945P TO-92 -RT-
Q502	4116610010	TRS. RN1001 -RT-
Q503	411020945P	TRS. 2SC945P TO-92 -RT-
Q601	411022120Y	TRS. 2SC2120Y TO-92 -RT-
Q602	4116610010	TRS. RN1001 -RT-
Q604	4110105610	TRS. 2SB561 TO-92 -RT-
Q605	411022120Y	TRS. 2SC2120Y TO-92 -RT-
Q606	41035010K1	TRS. FS10KM-6 TO-220FN
Q701	411020945P	TRS. 2SC945P TO-92 -RT-
Q702	411020945P	TRS. 2SC945P TO-92 -RT-
Q705	411020945P	TRS. 2SC945P TO-92 -RT-
Q706	411020945P	TRS. 2SC945P TO-92 -RT-
Q707	4116610010	TRS. RN1001 -RT-
Q901	411020945P	TRS. 2SC945P TO-92 -RT-
Q903	4100226880	TRS. 2SC2688 TO-126
Q904	4114501006	TRS. MCR100-6 TO-92 -RT-
Q905	4110105610	TRS. 2SB561 TO-92 -RT-
Q906	41035010K0	TRS. FS10KM-12 TO-220F
Q908	410030669A	TRS. 2SD669AWC TO-126
Q909	411022120Y	TRS. 2SC2120Y TO-92 -RT-
R201	4050510455	RES-CF 1/4W J 100K -AT- SMALL
R202	4257041802	RES-PR MF 1/4W F 18K AT SMALL
R203	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R204	4050551355	RES-CF 1/4W J 51K -AT- SMALL
R205	4050575255	RES-CF 1/4W J 7.5K -AT- SMALL
R206	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R207	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R208	4050520255	RES-CF 1/4W J 2K -AT- SMALL
R210	4050575355	RES-CF 1/4W J 75K SMALL -AT-
R211	4050520455	RES-CF 1/4W J 200K -AT- SMALL
R212	4257043572	RES-PR MF 1/4W F 35.7K AT SMAL
R213	4257046192	RES-PR MF 1/4W F 61.9K AT SMAL
R214	4050512355	RES-CF 1/4W J 12K -AT- SMALL
R215	4050575255	RES-CF 1/4W J 7.5K -AT- SMALL
R216	4050575455	RES-CF 1/4W J 750K SMALL -AT-
R217	4050513355	RES-CF 1/4W J 13K SMALL -AT-
R220	4257045902	RES-PR MF 1/4W F 59K SMALL -AT
R221	4257041543	RES-PR MF 1/4W F 154K SMALL -A
R222	4050510155	RES-CF 1/4W J 100R -AT- SMALL
R223	4050510155	RES-CF 1/4W J 100R -AT- SMALL
R224	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R225	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R226	4182033953	RES-FUSIBLE 2W J 3.3R -SF-
R227	4050516255	RES-CF 1/4W J 1.6K -AT- SMALL
R228	4050510355	RES-CF 1/4W J 10R -AT- SMALL
R230	4071012955	RES-MF 1W J 1.2R -AT-
R231	4050515355	RES-CF 1/4W J 15K -AT- SMALL
R232	4050547255	RES-CF 1/4W J 4.7K -AT- SMALL
R233	4050516255	RES-CF 1/4W J 1.6K -AT- SMALL
R234	4172022253	RES-MOF 2W J 2.2K -SF-
R235	4050543355	RES-CF 1/4W J 43K SMALL -AT-
R236	4050530355	RES-CF 1/4W J 30K SMALL -AT-
R237	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R238	4050520155	RES-CF 1/4W J 200R -AT- SMALL
R239	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R240	4050520455	RES-CF 1/4W J 200K -AT- SMALL
R241	4257046662	RES-PR MF 1/4W F 86.6K SMALL -
R242	4257043572	RES-PR MF 1/4W F 35.7K AT SMAL
R243	4050515355	RES-CF 1/4W J 15K -AT- SMALL

REF.	PART.NO.	DESCRIPTION
R301	4257043243	RES-PR MF 1/4W F 324K SMALL -A
R302	4257041003	RES-PR MF 1/4W F 100K AT SMALL
R303	4050530555	RES-CF 1/4W J 3M SMALL -AT-
R304	4050520255	RES-CF 1/4W J 2K -AT- SMALL
R305	4050568155	RES-CF 1/4W J 680R SMALL -AT-
R306	4050522255	RES-CF 1/4W J 2.2K -AT- SMALL
R307	4050539255	RES-CF 1/4W J 3.9K -AT- SMALL
R308	4050147355	RES-CF 1/2W J 47K SMALL -AT-
R312	4257044022	RES-PR MF 1/4W F 40.2K -AT- SM
R313	4050527255	RES-CF 1/4W J 2.7K -AT- SMALL
R314	4257048870	RES-PR MF 1/4W F 887R SMALL -A
R315	4257041802	RES-PR MF 1/4W F 18K AT SMALL
R316	4050522455	RES-CF 1/4W J 220K SMALL -AT-
R317	4050568155	RES-CF 1/4W J 680R SMALL -AT-
R318	4172033353	RES-MOF 2W J 33K -SF-
R320	4257044990	RES-PR MF 1/4W F 499R SMALL -A
R321	4050547155	RES-CF 1/4W J 470R SMALL -AT-
R322	4050522355	RES-CF 1/4W J 22K SMALL -AT-
R323	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R324	4050513355	RES-CF 1/4W J 13K SMALL -AT-
R325	4050522255	RES-CF 1/4W J 2.2K -AT- SMALL
R327	4050522955	RES-CF 1/4W J 2.2R SMALL -AT-
R328	4050522955	RES-CF 1/4W J 2.2R SMALL -AT-
R329	4050151955	RES-CF 1/2W J 5.1R SMALL -AT-
R340	4050510155	RES-CF 1/4W J 100R -AT- SMALL
R341	4257041912	RES-PR MF 1/4W F 19.1K SAMLL -
R342	4050520255	RES-CF 1/4W J 2K -AT- SMALL
R343	4257044991	RES-PR MF 1/4W F 4.99K AT SMAL
R344	4257041582	RES-PR MF 1/4W F 15.8K AT SMAL
R345	4050539255	RES-CF 1/4W J 3.9K -AT- SMALL
R346	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R347	4050556355	RES-CF 1/4W J 56K SMALL -AT-
R348	4050562355	RES-CF 1/4W J 62K SMALL -AT-
R349	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R350	4050175155	RES-CF 1/2W J 750R SMALL -AT-
R352	4050547155	RES-CF 1/4W J 470R SMALL -AT-
R353	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R356	4050515555	RES-CF 1/4W J 1.5M SMALL -AT-
R357	4050511255	RES-CF 1/4W J 1.1K SMALL -AT-
R358	4050520255	RES-CF 1/4W J 2K -AT- SMALL
R359	4172013053	RES-MOF 2W J 13R -SF-
R360	4172010153	RES-MOF 2W J 100R -SF-
R361	4050520255	RES-CF 1/4W J 2K -AT- SMALL
R362	4050527255	RES-CF 1/4W J 2.7K -AT- SMALL
R363	4050513355	RES-CF 1/4W J 13K SMALL -AT-
R364	4050515355	RES-CF 1/4W J 15K -AT- SMALL
R365	4050530355	RES-CF 1/4W J 30K SMALL -AT-
R366	4050510055	RES-CF 1/4W J 10R -AT- SMALL
R367	4050147055	RES-CF 1/2W J 47R -AT- SMALL
R369	4172012953	RES-MOF 2W J 1.2R -SF-
R370	4172012955	RES-MOF 2W J 1.2R -AT-
R371	4050122055	RES-CF 1/2W J 22R SMALL -AT-
R372	4050510255	RES-CF 1/4W J 10K -AT- SMALL
R373	4050551355	RES-CF 1/4W J 51K -AT- SMALL
R374	4050510455	RES-CF 1/4W J 100K -AT- SMALL
R375	4050510555	RES-CF 1/4W J 1M -AT- SMALL
R376	4171047953	RES-MOF 1W J 4.7R -SF-
R378	4171012153	RES-MOF 1W J 120R -SF-
R381	4050516255	RES-CF 1/4W J 1.6K -AT- SMALL
R384	4050547255	RES-CF 1/4W J 4.7K -AT- SMALL

REF.	PART.NO.	DESCRIPTION
R385	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R386	4050522555	RES-CF 1/4W J 2.2M SMALL -AT-
R387	4050512355	RES-CF 1/4W J 12K -AT- SMALL
R388	4050515355	RES-CF 1/4W J 15K -AT- SMALL
R389	4050522355	RES-CF 1/4W J 22K SMALL -AT-
R390	4257047152	RES-PR MF 1/4W F 71.5K SMALL -
R391	4050115354	RES-CF 1/2W J 15K SMALL -RT-
R392	4050110354	RES-CF 1/2W J 10K SMALL -RT-
R393	4050151054	RES-CF 1/2W J 51R SMALL -RT-
R394	4050591255	RES-CF 1/4W J 9.1K SMALL -AT-
R395	4050510555	RES-CF 1/4W J 1M -AT- SMALL
R396	4257046192	RES-PR MF 1/4W F 61.9K AT SMAL
R397	4050527455	RES-CF 1/4W J 270K SMALL -AT-
R398	4050533555	RES-CF 1/4W J 3.3M SMALL -AT-
R399	4050568355	RES-CF 1/4W J 68K -AT- SMALL
R3A0	4050522455	RES-CF 1/4W J 220K SMALL -AT-
R3A1	4050551355	RES-CF 1/4W J 51K -AT- SMALL
R3A2	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R3A3	4050515455	RES-CF 1/4W J 150K SMALL -AT-
R3A4	4050522255	RES-CF 1/4W J 2.2K -AT- SMALL
R3A5	4171020053	RES-MOF 1W J 20R -SF-
R3A6	4050510055	RES-CF 1/4W J 10R -AT- SMALL
R3A7	4050543455	RES-CF 1/4W J 430K SMALL -AT-
R3A8	4050543455	RES-CF 1/4W J 430K SMALL -AT-
R3A9	4050527255	RES-CF 1/4W J 2.7K -AT- SMALL
R3B0	4050120455	RES-CF 1/2W J 200K SMALL -AT-
R3B1	4050547155	RES-CF 1/4W J 470R SMALL -AT-
R3B2	4050575455	RES-CF 1/4W J 750K SMALL -AT-
R3B3	4050510155	RES-CF 1/4W J 100R -AT- SMALL
R3C1	4050112155	RES-CF 1/2W J 120R SMALL -AT-
R3C2	4050562155	RES-CF 1/4W J 620R SMALL -AT-
R3C4	4050510555	RES-CF 1/4W J 1M -AT- SMALL
R3C5	4257042213	RES-PR MF 1/4W F 221K SMALL -A
R3C6	4180412155	RES-FUSIBLE 1/4W J 120R -AT-
R3C7	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R3C8	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R3C9	4050536155	RES-CF 1/4W J 360R SMALL -AT-
R501	4050522355	RES-CF 1/4W J 22K SMALL -AT-
R502	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R503	4050512355	RES-CF 1/4W J 12K -AT- SMALL
R504	4050582255	RES-CF 1/4W J 8.2K -AT- SMALL
R505	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R506	4050582255	RES-CF 1/4W J 8.2K -AT- SMALL
R507	4050513255	RES-CF 1/4W J 1.3K -AT- SMALL
R508	4050568155	RES-CF 1/4W J 680R SMALL -AT-
R509	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R510	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R511	4050522355	RES-CF 1/4W J 22K SMALL -AT-
R512	4050510155	RES-CF 1/4W J 100R -AT- SMALL
R513	4050511455	RES-CF 1/4W J 110K SMALL -AT-
R601	4050510155	RES-CF 1/4W J 100R -AT- SMALL
R602	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R603	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R604	4257041802	RES-PR MF 1/4W F 18K AT SMALL
R605	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R606	4050522455	RES-CF 1/4W J 220K SMALL -AT-
R608	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R610	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R511	4050516255	RES-CF 1/4W J 1.6K -AT- SMALL
R512	4050582155	RES-CF 1/4W J 820R -AT- SMALL

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REF.	PART NO.	DESCRIPTION
R613	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R614	4050516255	RES-CF 1/4W J 1.6K -AT- SMALL
R615	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R616	4050510655	RES-CF 1/4W J 10M SMALL -AT-
R617	4257043572	RES-PR MF 1/4W F 35.7K AT SMAL
R618	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R619	4050518055	RES-CF 1/4W J 18R -AT- SMALL
R620	4050516255	RES-CF 1/4W J 1.6K -AT- SMALL
R622	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R623	4050510155	RES-CF 1/4W J 100R -AT- SMALL
R701	4050520155	RES-CF 1/4W J 200R -AT- SMALL
R702	4050547255	RES-CF 1/4W J 4.7K -AT- SMALL
R703	4050547255	RES-CF 1/4W J 4.7K -AT- SMALL
R704	4050520155	RES-CF 1/4W J 200R -AT- SMALL
R705	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R709	4050510155	RES-CF 1/4W J 100R -AT- SMALL
R710	4050510155	RES-CF 1/4W J 100R -AT- SMALL
R711	4050562155	RES-CF 1/4W J 620R SMALL -AT-
R712	4050547255	RES-CF 1/4W J 4.7K -AT- SMALL
R713	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R714	4050562155	RES-CF 1/4W J 620R SMALL -AT-
R715	4050547255	RES-CF 1/4W J 4.7K -AT- SMALL
R717	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R718	4050562155	RES-CF 1/4W J 620R SMALL -AT-
R719	4050510455	RES-CF 1/4W J 100K -AT- SMALL
R720	4050510455	RES-CF 1/4W J 100K -AT- SMALL
R721	4050547255	RES-CF 1/4W J 4.7K -AT- SMALL
R722	4050547255	RES-CF 1/4W J 4.7K -AT- SMALL
R723	4050513255	RES-CF 1/4W J 1.3K -AT- SMALL
R724	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R725	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R726	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R727	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R728	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R729	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R730	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R731	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R732	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R733	4050547255	RES-CF 1/4W J 4.7K -AT- SMALL
R734	4050547255	RES-CF 1/4W J 4.7K -AT- SMALL
R735	4050510155	RES-CF 1/4W J 100R -AT- SMALL
R901	4050156455	RES-CF 1/2W J 560K SMALL -AT-
R902	4050156455	RES-CF 1/2W J 560K SMALL -AT-
R903	7105010038	THMER, +-15% 10R 5A 15c W/KINK
R904	4071033853	RES-MF 1W J 0.33R -SF-
R905	4095010351	RES-WW 5W J 10K SQM-SF
R907	4050527255	RES-CF 1/4W J 2.7K -AT- SMALL
R909	4172015353	RES-MOF 2W J 15K -SF-
R910	4172015353	RES-MOF 2W J 15K -SF-
R914	4050520155	RES-CF 1/4W J 200R -AT- SMALL
R916	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R917	4257046041	RES-PR MF 1/4W F 6.04K SMALL -
R918	4050510355	RES-CF 1/4W J 10K -AT- SMALL
R919	4050515355	RES-CF 1/4W J 15K -AT- SMALL
R921	4050510155	RES-CF 1/4W J 100R -AT- SMALL
R922	4050582255	RES-CF 1/4W J 8.2K -AT- SMALL
R923	4050515355	RES-CF 1/4W J 15K -AT- SMALL
R924	4257044991	RES-PR MF 1/4W F 4.99K AT SMAL
R925	4050547055	RES-CF 1/4W J 47R -AT- SMALL
R926	4050510255	RES-CF 1/4W J 1K -AT- SMALL

REF.	PART NO.	DESCRIPTION
R927	4050575155	RES-CF 1/4W J 750R SMALL -AT-
R928	4257044991	RES-PR MF 1/4W F 4.99K AT SMAL
R929	4050533055	RES-CF 1/4W J 33R -AT- SMALL
R930	4050518055	RES-CF 1/4W J 18R -AT- SMALL
R931	4050527055	RES-CF 1/4W J 27R SMALL -AT-
R932	4050527255	RES-CF 1/4W J 2.7K -AT- SMALL
R933	4257044991	RES-PR MF 1/4W F 4.99K AT SMAL
R934	4050547255	RES-CF 1/4W J 4.7K -AT- SMALL
R935	4050568455	RES-CF 1/4W J 680K SMALL -AT-
R936	4050568455	RES-CF 1/4W J 680K SMALL -AT-
R937	4050547155	RES-CF 1/4W J 470R SMALL -AT-
R938	4050513255	RES-CF 1/4W J 1.3K -AT- SMALL
R939	4050533055	RES-CF 1/4W J 33R -AT- SMALL
R940	4050539055	RES-CF 1/4W J 39R -AT- SMALL
R941	4177224353	RES-MOF 2W J 24K SMALL -SF-
R943	4072033853	RES-MF 2W J 0.33R -SF-
R944	4171022153	RES-MOF 1W J 220R -SF-
R945	4050122155	RES-CF 1/2W J 220R -AT- SMALL
R946	4172033353	RES-MOF 2W J 33K -SF-
R947	4171051053	RES-MOF 1W J 51R -SF-
R948	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R949	4050112155	RES-CF 1/2W J 120R SMALL -AT-
R951	4050122355	RES-CF 1/2W J 22K SMALL -AT-
R952	4257046041	RES-PR MF 1/4W F 6.04K SMALL -
R953	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R954	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R955	4050547155	RES-CF 1/4W J 470R SMALL -AT-
R956	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R958	4050547255	RES-CF 1/4W J 4.7K -AT- SMALL
R959	4050575255	RES-CF 1/4W J 7.5K -AT- SMALL
R960	4050547255	RES-CF 1/4W J 4.7K -AT- SMALL
R961	4172020953	RES-MOF 2W J 2R -SF-
R963	4050518055	RES-CF 1/4W J 18R -AT- SMALL
R966	4050518055	RES-CF 1/4W J 18R -AT- SMALL
RL301	4420412002	RELAY 12V
RL901	4420412009	RELAY JW2aHN-DC12V
RN701	4082104725	RES-NET 10P J 4.7K COMMON
RN702	4082074725	RES-NET 7P J 4.7K COMMON
RN703	4082074725	RES-NET 7P J 4.7K COMMON
SW501	4490103551	EARPHONE JACK
T301	7050207F10	DRIVER TRANSFORMER
T302	7050307L10	F.B.T.
T303	7050519000	FOCUS TRANSFORMER
T601	7050254231	DRIVER TRANSFORMER
T602	4320205203	COIL CHOKE 2mH -SF-
T901	7064700103	COMMON MODE CHOKE 10MH
T902	7050107L10	POWER TRANSFORMER
VR301	5225150310	POT(CERMET) 0.3W 50K 6c LAY-DO
VR302	5225150310	POT(CERMET) 0.3W 50K 6c LAY-DO
VR303	5225110410	POT(CERMET) 0.3W 100K 6c LAY-D
VR601	5225150310	POT(CERMET) 0.3W 50K 6c LAY-DO
VR901	5225150200	POT(CERMET) 0.3W 5K 6c STAND-O
XT701	7154000005	CRYSTAL 4.00MHz
ZD201	41205005C1	DIODE ZENER HZ5C1 5.1V -AT-
ZD301	4120500152	DIODE ZENER 14.5-15.1V -AT-
ZD303	41205009C1	DIODE ZENER HZ9C1 -AT-
ZD305	4120510160	Z-D Z10-160B 1W 160V +-5% DO-4
ZD306	4120510160	Z-D Z10-160B 1W 160V +-5% DO-4
ZD501	41205009C1	DIODE ZENER HZ9C1 -AT-
ZD502	41205005C1	DIODE ZENER HZ5C1 5.1V -AT-

REF.	PART NO.	DESCRIPTION
ZD601	41205013BU	DIODE ZENER MTZJ13B -AT-
ZD701	41205003C2	DIODE ZENER HZ3C2 -AT-
ZD702	41205005C1	DIODE ZENER HZ5C1 5.1V -AT-
ZD901	4120502002	DIODE ZENER HZ20-2 1/2W 20V -A
ZD902	4120500152	DIODE ZENER 14.5-15.1V -AT-
ZD903	41205013BU	DIODE ZENER MTZJ13B -AT-
ZD904	41205013BU	DIODE ZENER MTZJ13B -AT-
ZD905	41205018G2	DIODE ZENER HZ18-2 V -AT-

9.3. Neck Board

REF.	PART NO.	DESCRIPTION
	SM7L320244-V	NECK PCB ASS'Y
	2008097L10	#HEAT SINK FOR IC1
	3340236016	#BEAD PIN 16.5X2.36mm
	4141118802	#P.C.S. VIDEO
	8026153008	SCREW B/HD M3X8 TAPPING "E" FOR HEAT NECK & NECK PCB X4
	8504113008	SCREW BIND(+) M3X8 MACH W/DISK FOR IC1
C1	5075104501	CAP-MEF 0.1UFJ 100V CF
C10	515X100T50	CAP-ECX 10UFM 50V -RT-
C11	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C12	515X109T50	CAP-ECX 1UFM 50V -RT-
C13	5156101T16	CAP-EC6 100UFM 16V -RT-
C14	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C15	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C16	7140104214	CAP-X7R 0.1UFM 100V -RT-
C17	515X100T01	CAP-ECX 10UFM 100V -RT-
C18	515X470S01	CAP-ECX 47UFM 100V -SF-
C19	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C2	7140104214	CAP-X7R 0.1UFM 100V -RT-
C20	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C21	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C22	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C23	5156101T16	CAP-EC6 100UFM 16V -RT-
C24	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C25	5116472111	CAP-MC 0.0047UFK 100V -RT-
C26	5156109T50	CAP-EC6 1UFM 50V -RT-
C27	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C28	5156101T16	CAP-EC6 100UFM 16V -RT-
C29	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C3	5075104501	CAP-MEF 0.1UFJ 100V CF
C30	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C31	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C32	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C33	5156100T50	CAP-EC6 10UFM 50V -RT-
C34	5156100T50	CAP-EC6 10UFM 50V -RT-
C35	5156100T50	CAP-EC6 10UFM 50V -RT-
C36	5156100T50	CAP-EC6 10UFM 50V -RT-
C37	5156109T50	CAP-EC6 1UFM 50V -RT-
C38	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C39	5121101552	CAP-CCCH 100PFJ 50V -RT-
C4	5075104501	CAP-MEF 0.1UFJ 100V CF
C40	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C41	5101222152	CAP-CCB 2200PFK 50V -RT-
C43	7140104214	CAP-X7R 0.1UFM 100V -RT-
C44	7140104214	CAP-X7R 0.1UFM 100V -RT-
C45	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C46	5156221T16	CAP-EC6 220UFM 16V -RT-
C47	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C48	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C5	7140104214	CAP-X7R 0.1UFM 100V -RT-
C51	5121330152	CAP-CCCH 33PFK 50V -RT-
C52	5121330152	CAP-CCCH 33PFK 50V -RT-
C53	5121330152	CAP-CCCH 33PFK 50V -RT-
C54	5156109T50	CAP-EC6 1UFM 50V -RT-
C55	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C56	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C58	5128331552	CAP-CCSL 330PFJ 50V -RT-
C59	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C6	7140104214	CAP-X7R 0.1UFM 100V -RT-
C60	5134104452	CAP-SCF 0.1UFZ 50V -RT-
C7	5156100T50	CAP-EC6 10UFM 50V -RT-
C8	51011021C3	CAP-CCB 1000PFK 2KV P:10MM -SF
C9	5104103463	CAP-CCF 0.01UFZ 1.5KV -SF-
CRT1	4570207L10	CRT SOCKET
D1	413258020U	DIODE BAV20 DO-35 -AT-
D11	413258020U	DIODE BAV20 DO-35 -AT-
D12	413258020U	DIODE BAV20 DO-35 -AT-
D13	413258020U	DIODE BAV20 DO-35 -AT-
D15	4120141480	DIODE 1N4148 (SI) -AT-
D16	4120141480	DIODE 1N4148 (SI) -AT-
D2	413258020U	DIODE BAV20 DO-35 -AT-
D21	413258020U	DIODE BAV20 DO-35 -AT-
D22	413258020U	DIODE BAV20 DO-35 -AT-
D23	413258020U	DIODE BAV20 DO-35 -AT-
D25	4120141480	DIODE 1N4148 (SI) -AT-
D26	4120141480	DIODE 1N4148 (SI) -AT-
D3	413258020U	DIODE BAV20 DO-35 -AT-
D31	413010426C	DIODE BYV26C KINK FORMING -AT-
D32	4120141480	DIODE 1N4148 (SI) -AT-
D33	4120141480	DIODE 1N4148 (SI) -AT-
D37	4120141480	DIODE 1N4148 (SI) -AT-
D38	4120141480	DIODE 1N4148 (SI) -AT-
D39	4120141480	DIODE 1N4148 (SI) -AT-
D40	4120141480	DIODE 1N4148 (SI) -AT-
D41	4120141480	DIODE 1N4148 (SI) -AT-
D42	4120141480	DIODE 1N4148 (SI) -AT-
D5	4120141480	DIODE 1N4148 (SI) -AT-
D6	4120141480	DIODE 1N4148 (SI) -AT-
D7	4120141480	DIODE 1N4148 (SI) -AT-
FB1	4322209046	FERRITE BEAD 2UH -AT-
FB11	4322209046	FERRITE BEAD 2UH -AT-
FB3	4322209046	FERRITE BEAD 2UH -AT-
FB4	4322209046	FERRITE BEAD 2UH -AT-
FB5	4322209046	FERRITE BEAD 2UH -AT-
FB6	4322209046	FERRITE BEAD 2UH -AT-
FB7	4322209046	FERRITE BEAD 2UH -AT-
IC1	4159240500	IC LM2405T
IC2	4159128100	IC LM1281 28PIN
IC3	4159393000	IC LM 393 8PIN
IC4	4159623930	IC M62393P 20PIN
IC5	4159350450	IC M35045-C81
L1	4321828006	COIL PEAKING 0.82UH -AT-
L31	4321828006	COIL PEAKING 0.82UH -AT-
L51	4321828006	COIL PEAKING 0.82UH -AT-
P1	4491200130	CONN. 12P B12B-XH-A

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REF.	PART NO.	DESCRIPTION
Q1	4113904220	TRS. BF422 TO-92
Q10	4111139040	TRS. 2N3904 TO-92 -RT-
Q11	4111139040	TRS. 2N3904 TO-92 -RT-
Q12	4116612030	TRS. RN1203 -RT-
Q2	4113904220	TRS. BF422 TO-92
Q3	4113904220	TRS. BF422 TO-92
Q4	4113904230	TRS. BF423 TO-92 -RT-
Q5	4113904230	TRS. BF423 TO-92 -RT-
Q6	4113904230	TRS. BF423 TO-92 -RT-
Q8	4116612030	TRS. RN1203 -RT-
Q9	4111139040	TRS. 2N3904 TO-92 -RT-
R1	4050512355	RES-CF 1/4W J 12K -AT- SMALL
R10	4060222115	RES-CC 1/2W K 220R -AT-
R11	4060222115	RES-CC 1/2W K 220R -AT-
R12	4060222115	RES-CC 1/2W K 220R -AT-
R13	4060210115	RES-CC 1/2W K 100R -AT-
R14	4060251315	RES-CC 1/2W K 51K -AT-
R15	4050518255	RES-CF 1/4W J 1.8K -AT- SMALL
R16	4050518255	RES-CF 1/4W J 1.8K -AT- SMALL
R17	4050518255	RES-CF 1/4W J 1.8K -AT- SMALL
R18	4050547355	RES-CF 1/4W J 47K -AT- SMALL
R19	4050522255	RES-CF 1/4W J 2.2K -AT- SMALL
R2	4050510555	RES-CF 1/4W J 1M -AT- SMALL
R20	4180233955	RES-FUSIBLE 1/2W J 3.3R -AT-
R21	4050520155	RES-CF 1/4W J 200R -AT- SMALL
R22	4050539155	RES-CF 1/4W J 390R -AT- SMALL
R23	4050520155	RES-CF 1/4W J 200R -AT- SMALL
R24	4050539155	RES-CF 1/4W J 390R -AT- SMALL
R25	4050520155	RES-CF 1/4W J 200R -AT- SMALL
R26	4050539155	RES-CF 1/4W J 390R -AT- SMALL
R27	4050533055	RES-CF 1/4W J 33R -AT- SMALL
R28	4050533055	RES-CF 1/4W J 33R -AT- SMALL
R29	4050533055	RES-CF 1/4W J 33R -AT- SMALL
R3	4050512355	RES-CF 1/4W J 12K -AT- SMALL
R30	4050522255	RES-CF 1/4W J 2.2K -AT- SMALL
R31	4050512355	RES-CF 1/4W J 12K -AT- SMALL
R32	4050512355	RES-CF 1/4W J 12K -AT- SMALL
R33	4050512355	RES-CF 1/4W J 12K -AT- SMALL
R34	4050512355	RES-CF 1/4W J 12K -AT- SMALL
R35	4050510155	RES-CF 1/4W J 100R -AT- SMALL
R36	4050510155	RES-CF 1/4W J 100R -AT- SMALL
R37	4050510155	RES-CF 1/4W J 100R -AT- SMALL
R38	4257047509	RES-PR MF 1/4W F 75R AT SMALL
R39	4257047509	RES-PR MF 1/4W F 75R AT SMALL
R4	4050512355	RES-CF 1/4W J 12K -AT- SMALL
R40	4050533055	RES-CF 1/4W J 33R -AT- SMALL
R41	4050547355	RES-CF 1/4W J 47K -AT- SMALL
R42	4257047509	RES-PR MF 1/4W F 75R AT SMALL
R43	4050522255	RES-CF 1/4W J 2.2K -AT- SMALL
R44	4050522255	RES-CF 1/4W J 2.2K -AT- SMALL
R45	4050510455	RES-CF 1/4W J 100K -AT- SMALL
R46	4050522155	RES-CF 1/4W J 220R SMALL -AT-
R47	4050539255	RES-CF 1/4W J 3.9K -AT- SMALL
R48	4050530455	RES-CF 1/4W J 300K SMALL -AT-
R49	4050547355	RES-CF 1/4W J 47K -AT- SMALL
R5	4050512355	RES-CF 1/4W J 12K -AT- SMALL
R50	4050568155	RES-CF 1/4W J 680R SMALL -AT-
R51	4180215255	RES-FUSIBLE 1/2W J 1.5K -AT-
R52	4050510155	RES-CF 1/4W J 100R -AT- SMALL
R53	4050510255	RES-CF 1/4W J 1K -AT- SMALL

REF.	PART NO.	DESCRIPTION
R54	4050510155	RES-CF 1/4W J 100R -AT- SMALL
R55	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R56	4050551455	RES-CF 1/4W J 510K SMALL -AT-
R57	4050515155	RES-CF 1/4W J 150R SMALL -AT-
R58	4050547355	RES-CF 1/4W J 47K -AT- SMALL
R59	4050510455	RES-CF 1/4W J 100K -AT- SMALL
R6	4050510555	RES-CF 1/4W J 1M -AT- SMALL
R60	4050539155	RES-CF 1/4W J 390R -AT- SMALL
R61	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R62	4050510155	RES-CF 1/4W J 100R -AT- SMALL
R63	4050547355	RES-CF 1/4W J 47K -AT- SMALL
R64	4050547255	RES-CF 1/4W J 4.7K -AT- SMALL
R65	4050547255	RES-CF 1/4W J 4.7K -AT- SMALL
R66	4050533255	RES-CF 1/4W J 3.3K -AT- SMALL
R67	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R68	4050512355	RES-CF 1/4W J 12K -AT- SMALL
R69	4050547355	RES-CF 1/4W J 47K -AT- SMALL
R7	4050512355	RES-CF 1/4W J 12K -AT- SMALL
R70	4050510155	RES-CF 1/4W J 100R -AT- SMALL
R72	4050547355	RES-CF 1/4W J 47K -AT- SMALL
R73	4050522255	RES-CF 1/4W J 2.2K -AT- SMALL
R74	4050582255	RES-CF 1/4W J 8.2K -AT- SMALL
R75	4050522255	RES-CF 1/4W J 2.2K -AT- SMALL
R76	4050168055	RES-CF 1/2 W J 68R -AT- SMALL
R77	4050168055	RES-CF 1/2 W J 68R -AT- SMALL
R78	4050168055	RES-CF 1/2 W J 68R -AT- SMALL
R79	4050547255	RES-CF 1/4W J 4.7K -AT- SMALL
R8	4050510555	RES-CF 1/4W J 1M -AT- SMALL
R80	4050520355	RES-CF 1/4W J 20K -AT- SMALL
R81	4050520355	RES-CF 1/4W J 20K -AT- SMALL
R82	4050520355	RES-CF 1/4W J 20K -AT- SMALL
R83	4050547355	RES-CF 1/4W J 47K -AT- SMALL
R85	4050510155	RES-CF 1/4W J 100R -AT- SMALL
R86	4050547255	RES-CF 1/4W J 4.7K -AT- SMALL
R87	4050510255	RES-CF 1/4W J 1K -AT- SMALL
R9	4050512355	RES-CF 1/4W J 12K -AT- SMALL
SG2	5106152304	SPARK GAP 1.5KV AG-15 P:5.0mm
ZD2	41205004A2	DIODE ZENER HZ4A2 -AT-
ZD3	41205C51AU	DIODE ZENER MTZJ5.1A -AT-

9.4. Earphone Board

REF.	PART NO.	DESCRIPTION
	SS7L320320 -404	EARPHONE PCB ASSY
	4141124000	#P.C.B. EARPHONE
	C486050079	CONN. 5P & WIRE ASSY FOR P530 TO P503
C530	5152109T50	CAP-EC2 1UFM 50V 4X7mm
C531	5152109T50	CAP-EC2 1UFM 50V 4X7mm
FB501	4322209005	FERRITE BEAD 2UH
FB502	4322209005	FERRITE BEAD 2UH
P531	4490400130	CONN. 4P WAFER (BXB-XH-A) P2.5
R530	4050575055	RES-CF 1/4W J 75R -AT- SMALL
R531	4050575055	RES-CF 1/4W J 75R -AT- SMALL
SWS30	4490103551	EARPHONE JACK

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9.5. Control Board

REF.	PART NO.	DESCRIPTION
	SS7L320420 -404	CONTROL PCB ASS'Y
	3622300073	LED HOLDER FOR LED
	36223LE004	LED HOLDER FOR LED 802
	4141123300	#P.C.B. CONTROL
	C489120026	CONN. 12P & WIRE ASS'Y 200mm FOR P801
D801	4120141480	DIODE 1N4148 (SI) -AT-
D802	4120141480	DIODE 1N4148 (SI) -AT-
LED801	4120600790	LED L-79GCA 4.8¢ 3PIN GRN/YEL
LED802	4120600530	#LED L-53YC
SW801	4410604040	KEYSWITCH TACT SKHHAM2520 1KEY
SW802	4410604040	KEYSWITCH TACT SKHHAM2520 1KEY
SW803	4410604040	KEYSWITCH TACT SKHHAM2520 1KEY
SW804	4410604040	KEYSWITCH TACT SKHHAM2520 1KEY
SW805	4410604040	KEYSWITCH TACT SKHHAM2520 1KEY
SW806	4410604040	KEYSWITCH TACT SKHHAM2520 1KEY
SW807	4410604040	KEYSWITCH TACT SKHHAM2520 1KEY

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TABLE OF CONTENTS

PRECAUTIONS & SAFETY NOTICES ..... PREFACE

1. SPECIFICATIONS 1-1

1.1 CONTROL FUNCTIONS & LOCATIONS 1-1
1.2 PRODUCT OVERVIEW 1-2
1.3 CRT CHARACTERISTICS 1-2
1.4 POWER SPECIFICATIONS 1-2
1.5 INTEGRATED AUDIO SPECIFICATIONS 1-2
1.6 VIDEO SPECIFICATIONS 1-2
1.7 SYNC INPUT SIGNAL CHARACTERISICS 1-3
1.8 ENVIRONMENTAL 1-3
1.9 PRESET TIMING 1-3

2. DISASSEMBLY INSTRUCTIONS 2-1

3. THEORY OF OPERATION 3-1

3.1 SWITCHING POWER SUPPLY 3-1
3.2 DEFLECTION CIRCUIT 3-2
3.3 AUDIO AMPLIFIER CIRCUIT 3-12
3.4 VIDEO AMPLIFIER 3-12
3.5 MICROPROCESSOR & SYNC PROCESSING 3-13

4. ADJUSTMENTS 4-1

4.1 SETUP & TEST EQUIPMENT 4-1
4.2 - 4.22 ADJUSTMENT PROCEDURES 4-1

5. TROUBLESHOOTING GUIDE 5-1

6. PCB LAYOUTS 6-1

6.1 MAIN PCB 6-1
6.2, 6.3 NECK, CONTROL, & EARPHONE PCB'S 6-2
6.4 WIRING CONNECTIONS 6-4

7. SCHEMATIC DIAGRAMS .....

7.1 S/P/S CIRCUIT DIAGRAM 7-1
7.2 NECK CIRCUIT DIAGRAM 7-2
7.3 DEFLECTION 7-3

8. EXPLODED PARTS VIEW & TOP ASSEMBLY 8-1

9. PARTS LISTS 9-1

Preface
Before You Start

General Safety Precautions

1. Use an isolation transformer in the power line and AC supply to troubleshoot.
2. When servicing, observe the original lead dress, especially in the high voltage circuits. If a short circuit is found, replace all parts which have been overheated or damaged.
3. Potentials, as high as 26kV are present when this display is in operation. Operation of the display without the rear cover involves the danger of a shock hazard from the display power supply. Servicing should not be attempted by anyone who is not thoroughly familiar with the precautions necessary when working on high voltage equipment. Always discharge the anode of the picture tube to the display chassis before handling the tube.
4. After servicing, be sure to check the items listed in the Safety Checkout, below before returning the serviced unit to the customer.

Safety Checkout

The following checks must be made after correcting the original service problem and before the unit is returned to the customer.

1. Check the area of your repair for unsoldered or poorly soldered connections. Check the entire board surface for solder splashes and bridges.
2. Check the inter board wiring to ensure that no wires are pinched or coated with high-wattage resistors.
3. Check that all control knobs, shields, covers, ground straps and mounting hardware have been replaced. Make absolutely sure you have replaced all the insulators.
4. Look for any unauthorized replacement parts, particularly transistors, that may have been installed during a previous repair. Point them out to the customer and recommend their replacement.
5. Look for parts which, though functioning, show obvious signs of deterioration. Point them out to the customer and recommend their replacement.
6. Check the line cord for cracks and abrasion. Recommend the replacement of any such line cord to the customer.
7. After making any repair, check the B+ and HV to see whether they are at the values specified. Make sure your instruments are accurate; if your HV meter always shows a low HV, check the meter to ensure it is not malfunctioning.
8. Carry out the leakage current checks as detailed below overleaf.

Leakage Current Cold Check

1. Unplug the AC cord and connect a jumper between the two prongs on the plug.
2. Turn on the display power switch.
3. Use an ohmmeter to measure the resistance value between the jumpered AC plug and each exposed metallic cabinet part on the display, such as screwheads, terminals control shafts, etc. When an exposed metallic part has a return path to the chassis, the reading should be between 240k and 5.2M. When exposed metal does not have a return path to the chassis, the reading must be.

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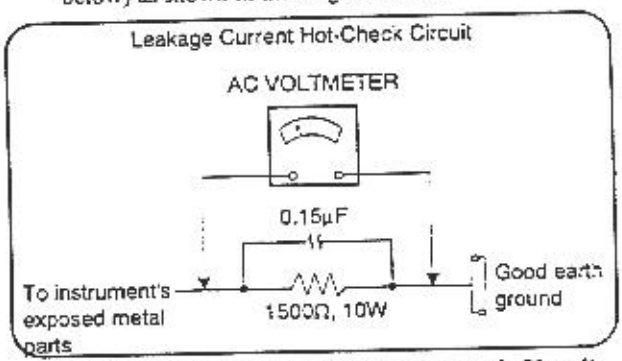
Leakage Current Hot Check

1. Plug the AC cord into the AC outlet. Do not use an isolation transformer for this check.
2. Connect a 1.5k, 10 watt resistor in parallel with a 0.15F capacitor between each exposed metallic part on the set and a good earth ground (see How to Find a Good Earth, below) as shown in the diagram below.



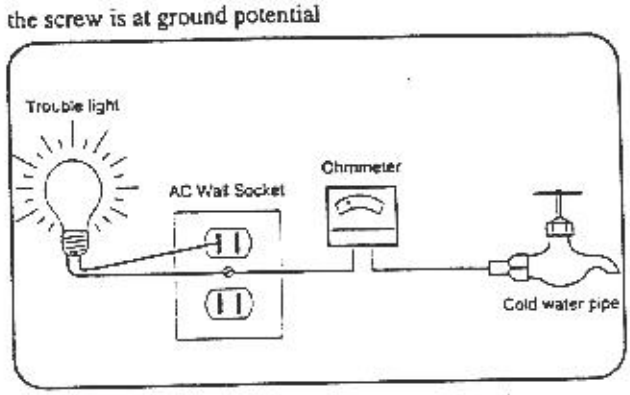
Example of Leakage Current Hot-Check Circuit

3. Use an AC voltmeter with 1000 ohms/volt or more sensitivity to measure the potential across the resistor.
4. Check each exposed metallic part, and measure the voltage at each point.
5. Reverse the polarity of the AC plug in the AC outlet and repeat the above measurements.
6. The potential at any point should not exceed 0.75 volt RMS. A leakage current tester (Simpson Model 229, RCA WT-540A or equivalent) may be used to make the hot checks.

Leakage current must not exceed 0.5 milliamp. If a measurement is outside of the specified limit, there is a possibility of a shock hazard and the monitor should be repaired and rechecked before it is returned to the customer.

How to Find A Good Earth

A cold water pipe is a guaranteed earth ground; the cover plate retaining screw on most AC outlet boxes is also at earth ground. If the retaining screw is to be used as your earth ground, verify that it is at ground by measuring the resistance between it and a cold water pipe with an ohmmeter. The reading should be zero (0) ohms. If a cold water pipe is not accessible, connect a 60-100 watt trouble light (not a neon lamp) between the hot side of an AC power receptacle and the retaining screw. Try both slots, if necessary, to locate the hot side of the line. The lamp should light at normal brilliance if the screw is at ground potential



How to Check for Earth Ground

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Section 1.
Product Specification

1.1. Monitor Control Locations and Functions 1-1
1.2. Product Overview 1-2
1.3. CRT Characteristics 1-2
1.4. Power Specifications 1-2
1.5. Integrated Audio Specification 1-2
1.6. Video Specifications 1-2
1.7. Sync Input Signal Characteristics 1-3
1.8. Environmental 1-3
1.9. Preset Timing Modes 1-3

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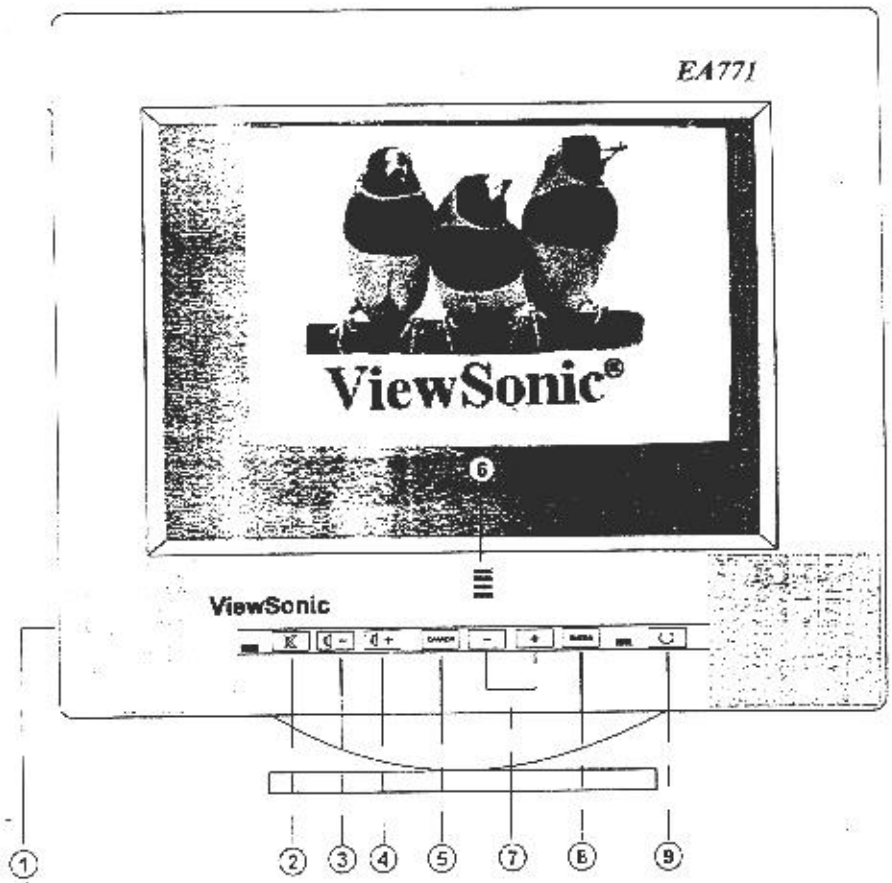
1.1. Monitor Control Locations & Functions



KEY TO MONITOR CONTROL FUNCTIONS		
(1)	Head Phone Jack	This jack is used to connect a head phone output in the monitor.
(2)	Mute Key	Use mute button, when active shall mute the internal speakers and external earphone.
(3)	Speaker "- " key	Press to decrease speaker volume.
(4)	Speaker "+" key	Press to increase speaker volume.
(5)	"ONVIEW" for OSD on/off and thumbwheel selection confirm	Press to call up OSD function onto screen and confirm the "+, "-" keys selection for OSD icon.
(6)	Microphone	This microphone is used to speak on monitor inside.
(7)	"+" "-" adjusting setting and OSD function selection	Adjust setting of currently selected OSD icon or measurement "+" key to increase, "-" key to decrease.
(8)	"ENTER" key	For select OSD function "icon change" or "measurement "-" key to decrease, "+" key increase.
(9)	Power On/Off	Hard power ON/OFF button. Adjacent LED is lit when on. The LED color is green for normal condition and change to orange for DPMS condition.

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1.2. Product Overview

The monitor installed in the EA771/EA771-Euro (SMS-7L32/3) phom described in this service manual has the following features:

- 17 inches 0.27mm dot pitch conventional C.R.T
- 30k~70khz horizontal scanning
- 50~120Hz vertical refresh rate scanning
- 28 total memory modes in standard configuration
- Universal segmented auto range Power Supply
- VESA/NUTEK/EPA compliant power management

1.3. CRT Characteristics

- Screen Size ..... 17 inches
- Faceplate Type ..... FS
- Phosphor Dot Pitch..... 0.27mm, delta arrangement
- Electron Gun..... 29mm, precision-in-line construction
- Deflection Angle ..... 90 degree diagonal
- Shadow Mask ..... Invar
- Phosphor Type P22
- Phosphor Persistence ..... Medium Short
- Standard Light Transmission 54% Typical

1.4. Power Specifications

1.4.1. Power Supply

- A/C Receptacle..... IEC320
- Power Supply Type ..... Universal
- A/C Line Voltage Ranges .. 88VAC~132VAC 180VAC~264VAC
- A/C Line Frequency Ranges 50Hz/60Hz±3Hz
- Inrush Current..... 30A/132V or 50A/264V (at cold start)
- Leakage Current ..... ≤3.5mA
- Degauss..... Automatic and Manual (20 minutes for a full recovery)

1.4.2. Power Management

- Summary of operating states:

APM State	LED Color	Power Consumption	Automatic Recovery Time
On	Green	< 110W	Not applicable
Standby	Orange	< 30W	<3 seconds
Suspend	Orange	< 8W	<10 seconds
Off	Orange	< 8W	<10 seconds

- Signaling compliant with VESA DPMS guidelines
- Nutek 1992 guidelines ..... Suspend<30 watts, off<8 watts
- EPA energy star ..... Standby<30 watts

1.5. Integrated Audio Specifications

1.5.1. Audio Power Amplifier

- Output power ..... 1.5w per channel minmum, @ 10% THD at 1kHz
- Supply voltage ..... +12VDC, 0.5V, 30mA-0.6A (average 0.25A)
- Frequency response ..... 100Hz to 15kHz, 3dB
- Input level ..... 1V rms

1.5.2. Speakers

- Speaker type..... 40mm x 70mm oval cone type x2
- Impedance ..... 8ohms @ 800Hz
- Rated input power 2W
- Frequency response ..... Up to 15kHz, 20dB maximum

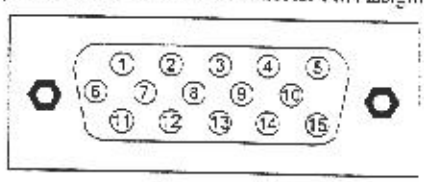
1.6. Video Specifications

1.6.1. Video Amplifier Performance

- Bandwidth (dot rate) 86MHz
- Typical 10%~90% rise and fall times....calculation:12ns
- Video generator rise / fall times.....2ns maximum
- Scope and probe bandwidth... 350MHz minimum
- Probe capacitance..... 2.5pf
- Overshoot / Undershoot..... 10% maximum
- Sync on Green ..... Amplitude: 714mV maximum, sync on green amplitude: 286mV maximum

1.6.2. Video Input Signal Characteristics

- Video Type..... Analog
- Amplitude ..... 700mV maximum
- Video Input Impedance .... 75 Ohms±1%
- Optional DDC 1/2B video Connector Pin Assignments:



pin	Signal	pin	Signal	pin	Signal
1	Red video	6	Red return	11	Monitor GND
2	Green video	7	Green return	12	SDA
3	Blue video	8	Blue return	13	H. sync
4	Monitor GND	9	No pin	14	V.sync/VCLK
5	No pin	10	Sync return	15	SCL

1.7. Sync Input Signal Characteristics

1.7.1. Separate Sync

- Sync Type ..... TTL
- Amplitude ..... 2.4V minimum (Logic High), 0.8V max.(Logic Low)
- Polarity ..... Positive or Negative
- Equalization pulses ..... Not allowed

1.7.2. Composite Sync

- Sync Type ..... TTL
- Amplitude ..... 2.4V minimum (Logic High), 0.8V max.(Logic Low)
- Polarity ..... Positive or Negative
- Serration Pulses ..... Allowed at horizontal rate
- Equalization pulses ..... Not allowed

1.7.3. Sync on Green

- Sync Type ..... AS per apple
- Amplitude ..... 0V minimum (Logic High), -286V max.(Logic Low)
- Polarity ..... Negative/Composite
- Serration Pulses ..... Allowed at horizontal rate
- Equalization pulses ..... Not allowed

1.8. Environmental

1.8.1. Temperature/Humidity/Altitude

OPERATING :

- Temperature ..... 10°C to 35°C
- Relative Humidity ... 0 to 90%,non-condensation
- Altitude ..... 0 to 10,000 feet

Note : The display will operate within 10°C to 35°C in all modes but may not meet all the visual performance criterion listed in spec section 6.0 at temperature extremes.

NON-OPERATING :

- Temperature ..... -40°C to +65°C
- Relative Humidity ... 0 to 95%,non-condensation
- Altitude ..... 0 to 40,000 feet

1.8.2. Vibration Test

UNPACKED UNIT :

	Frequency	Amplitude	Acceleration(G)
1	5-22Hz	0.25mm	-
2	22-500Hz	-	0.25G

Times/Cycle:

- Rise Time ..... 10 Minutes
- Fall Time ..... 10 Minutes
- Number of Sweeps ..... 1 Cycle
- Axis ..... X,Y,Z
- Total Times ..... 60 Minutes

PACKAGED UNIT :

	Frequency	Amplitude	Acceleration(G)
1	5-250Hz	-	0.83G
2	-	-	-

Times/Cycle:

- Rise Time ..... 10 Minutes
- Fall Time ..... 10 Minutes
- Number of Sweeps ..... 1 Cycle
- Axis ..... X,Y,Z
- Total Times ..... 60 Minutes

1.8.3. Drop Test

- Compliant with NSTA Project 1A guidelines
- Drop Height 46cm
- Test Direction ..... 1 Corner, 3 Edges, 6 Faces

1.9. Preset Timing Modes

This display has 6 preset display modes configured during manufacture, given in the following table:

Model No.	Hf KHz	Vf Hz	Dot x Line
01	37.500	75.000	640x480
02	46.875	75.000	800x600
03	60.023	75.020	1024x768
04	63.980	60.010	1280x1024
05	31.469	59.942	640x480
06	60.241	74.927	1024x768

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Section 2.
Disassembly Instructions

2.1. Remove the Rear Cover 2-1
2.2. Remove the Bottom Shield 2-1
2.3. Internal Disassembly (Right Side) 2-1
2.4. Internal Disassembly (Left Side) 2-1
2.5. Remove the Neck Board and Main Board 2-2
2.6. Remove the Earphone Board and Control Board ... 2-2

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2.1. Remove the Rear Cover

1. Remove the four screws at the rear cover. Refer to the figure 2-1 (A).
2. Remove the rear cover.

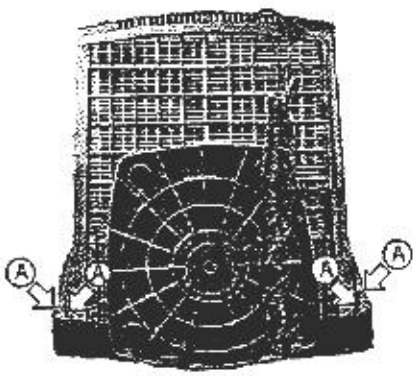

Figure 2-1 Remove the Rear Cover

2.2. Remove the Bottom Shield

1. Remove the three crews at the bottom shield. Refer to the figure 2-2 (A).
2. Remove the three solders. Refer to the figure 2-2 (B).
3. Remove the bottom shield.
4. Remove the two screws at the holder. Refer to the figure 2-2 (C).
5. Remove the two holders.

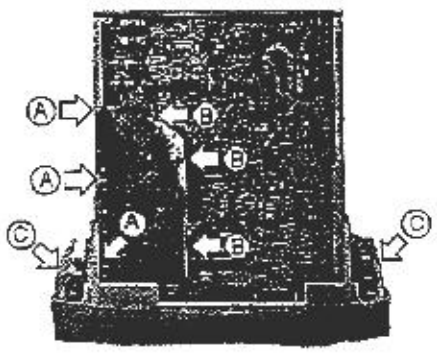

Figure 2-2 Remove the Bottom Shield

2.3. Internal Disassembly (Right side)

The neck board is plugged on to the CRT neck and is enclosed in a metal shielding.

1. Cut the cable tie. Refer to the figure 2-3 (A).
2. Disconnect the two ground wires. Refer to the figure 2-3 (B).
3. Remove the two connected pins from the main board. Refer to the figure 2-3 (C).
4. Remove the connecter pin from the neck board. Refer to the figure 2-3 (D).
5. Remove the screw at the bezel. Refer to the figure 2-3 (E).

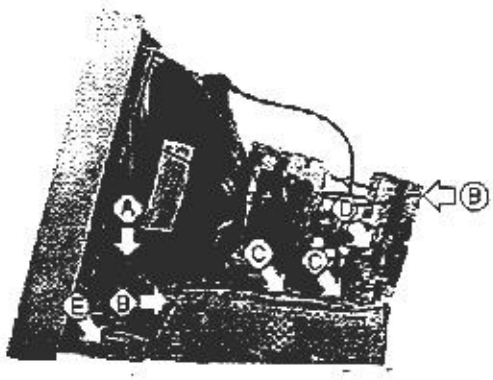

Figure 2-3 Internal Disassembly (right side)

2.4. Internal Disassembly (Left Side)

1. Cut the cable tie. Refer to the figure 2-4 (A).
2. Disconnect the ground wire from the U-bracket. Refer to the figure 2-4 (B).
3. Cut the cable tie and disconnect the ground wire. Refer to the figure 2-4 (C).
4. Disconnect the two connected pins from the main board. Refer to the figure 2-4 (D).

IMPORTANT NOTE

To avoid risk of electric shock, before removing the anode cap, made sure the anode has been completely discharged as high voltage may remain on the anode for extended time after power off.

5. Remove the anode cap from the CRT. Refer to the figure 2-4 (E).
6. Release the cord cramp. Refer to the figure 2-4 (F).
7. Remove the screw at the speaker chassis. Refer to the figure 2-4 (G).

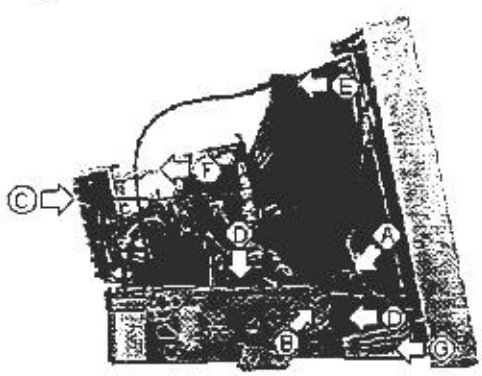

Figure 2-4 Internal Disassembly (left side)

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2.5. Remove the Neck Board & Main Board

1. Remove the seven solder sides from the neck board. Refer to the figure 2-5 (A).
2. Remove neck shield.
3. Remove neck board.
4. The CRT display side downward.
5. Remove the main board out of bezel.
6. Disconnect the three connected pins from the main board. Refer to the figure 2-6 (A).
7. Release the cord cramp from the main board. Refer to the figure 2-6 (B).
8. Cut the two cable ties from the main board. Refer to the figure 2-6 (C).
9. Release the cable wire from the heat sink. Refer to the figure 2-6 (D).
10. Remove the main board.

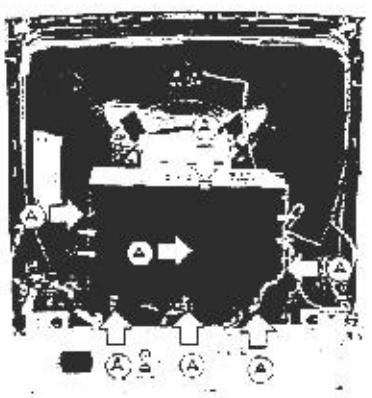

Figure 2-5 Remove the Neck Board

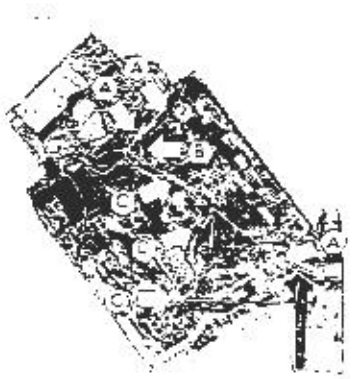

Figure 2-6 Remove the Main Board

2.6. Remove the Earphone Board & Control Board

1. Remove the four screws at the speaker chassis. Refer to the figure 2-7 (A).
2. Remove the speaker chassis.
3. Remove the screw at the holder. Refer to the figure 2-7 (B).
4. Remove the earphone board.
5. Remove the four screws at the control board. Refer to the figure 2-8 (B).
6. Remove the control board.

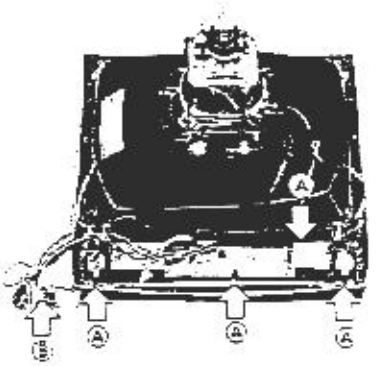

Figure 2-7 Remove the Earphone Board

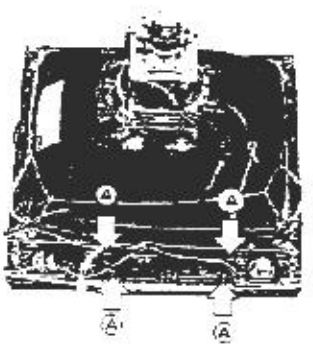

Figure 2-8 Remove the Control Board

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Section 3.
Theory of Operation

3.1. Switching Power Supply 3-1
3.2. The Deflection Circuit 3-2
3.3. Audio Amplifier Circuit 3-12
3.4. Video Amplifier 3-12
3.5. Microprocessor and Sync Processing 3-13

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3.1. Switching Power Supply

The switching power supply (SPS) used in this display is a 130W flyback mode type. The power supply provides seven outputs (180V, 75V, 15V, +12V, 6.3V, +15V and +5V). Please refer to schematic diagram for details of the circuit layout. The input voltage is from 88VAC — 264VAC with an input frequency of 47Hz — 63Hz. as shown in figure 3-1.

The current first passes through the EMI control circuit and is regulated to DC by the bridge diode (BD901) and filter capacitor (C902). During rectification a large current surge is generated and as C907 has a very low impedance while being charged the fuse, on/off switch and bridge diode are all liable to be damaged. For this reason, a thermal resistor (NTCR) is added before the bridge diode in order to limit the large current surge generated during the charging of the capacitor.

During rectification, C946 is charged through R909 and R910. When C946 is charged to 16V, IC901 3842A starts to operate (for details, of the functions of this IC, please refer to the relevant data sheet) and outputs a pulse signal from Pin 6 to set the transistor Q906 in the ON state. At this time, transformer T902, which is connected in parallel, starts to store power. When the current passing through the resistor R943, and the supplementary current from R935, R936 and R918 into Pin 3 of IC901 reaches 1.1V, IC901 is reset, causing the energy stored by the transformer to reach the rated value. In order to prevent the transformer from being saturated and causing damage to the transistor, when transistor Q906 is in the OFF state, the energy stored in the transformer T902 is released into the secondary coil and is regulated through the various output loops and filters and converted to the required DC output. In addition to this, at the appropriate time, the windings pin1 — pin2 supply Pin 7 of IC901 with a fixed power supply for normal operation. Also, when windings pin1 — pin3 are in power saving active state, power is supplied to Pin 7 of IC901 for normal operation.

In any of the above cased, the output pulse is terminated and the FET(Q906) is turned off, causing the voltage on the output of the FET(Q906) to rise rapidly, and the voltage across the winding of the primary to reverse in polarity, thus tending to reset the flux within the core. At this point, the diodes D914~D916 and D918~D922 on the secondary supply winding become forward biased and begin to conduct, thus transferring energy from primary to the secondary, and charging the secondary capacitors.

There is also secondary winding the primary side of the power supply which, through diode D903 and Q903 recharges the control IC901 reservoir capacitor C946. This supply then keep the IC901 running. In the event of a secondary short circuit, the supply fails to recharge, thus the voltage across C946 drops to a threshold limit below which the IC901 cuts out and returns to its low current load operation.

During normal operation, the supply rails charge until the error amplifier realized by IC902 on the secondary begins to turn on the opto-coupler, PH901. At this point, the photo-transistor of this opto-coupler on the primary side begins to conduct, draining current from the primary control IC901 supply through diode D902 and D904.

Under normal operation IC902 regulates the current flow through PH901, and hence determines the output voltage of the error amplifier internal to IC901. Various passive components around IC902 and IC901 set the gain compensation for optimum stability and regulation characteristics.

In the event of a fault condition occurring, either Q905 may be turned on by the lack of voltage at pin2 of IC901 or zener diode ZD901 may conduct, due to excessive voltage on the primary IC901 supply. In the latter case, the triac Q904 will fire, thus dragging down the output of the control IC901 error amplifier, which in turn will limit the duty cycle and reduce the output voltage. It will stay in this mode until the AC input power is removed.

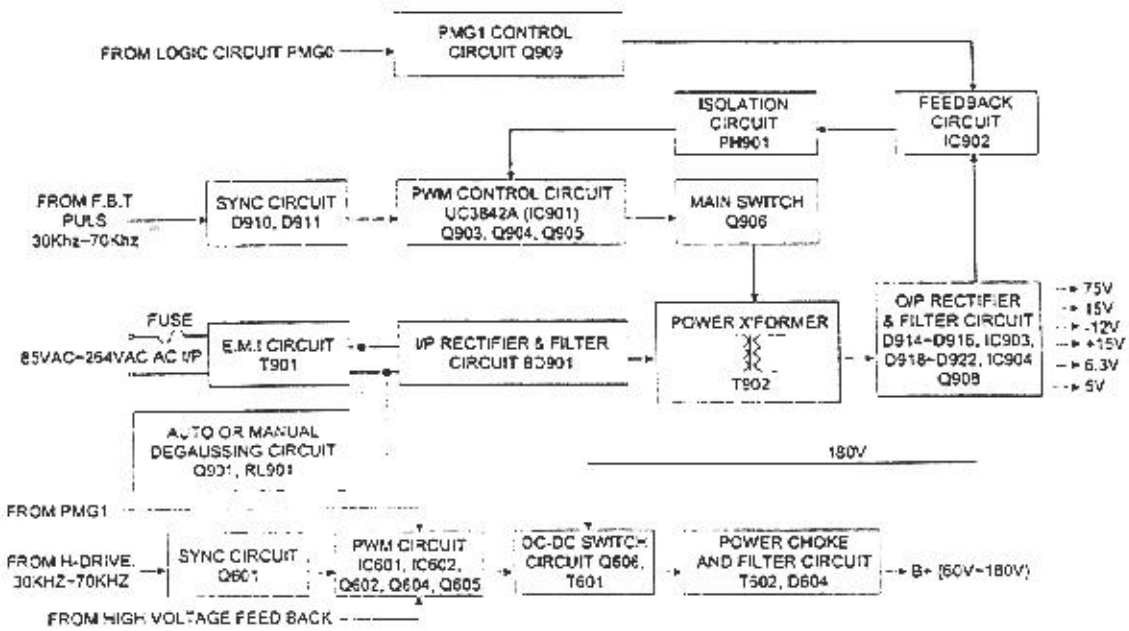

Figure 3-1 Switching Power Supply Block Diagram

When the feedback signal passing through the main 75V output is completed, the transistor's duty cycle is adjusted through the transfer to Pin 2 of IC901 3842A of the primary coil by PH901 4N35 and IC902 TL431, stabilizing the output current. At this time, it is important to note that before the feedback signal is established, the charge level of C910 cannot trigger Q904 SCR or it will cause a faulty power startup. In addition, in order to synchronize the supply power and monitor and reduce noise that will cause interference to the display, in the area D910 the monitor's feedback transformer gets a feedback signal in order to ensure synchronization between the power supply and monitor, with synchronization in the range 30kHz~70kHz. Because the power operating frequency changes with the monitor causing changes in the value of IP, (the value of LP is fixed while the value of IP increase or decreases according to the frequency), this affects the test value of Pin 3 of IC901 3842A. This causes the total power supplied to vary according to the frequency, so a compensation value is provided by D911 in order to reduce the difference in total power for different frequencies. In addition, because the AC input ranges from 85VAC to 264VAC, this causes the value of the direct current on the DC bus to vary, effecting the rise rate of IP, the oscillator and the duty cycle, and causing the test value obtained at Pin 3 of IC901 to vary. To resolve this, a compensation value is provided by R935 and R936 which reduces the difference resulting from the different input voltages.

3.1.1. Auto-degaussing

When base of Q901 connector is in high state, the transistor Q901 2SC945P is on, causing the relay to jump from Normal Open (N.O.) to Normal Close (N. C.) to perform auto-degaussing operations. The duration of this operation is controlled by a logic pulse and lasts approximately 6 (six) seconds. When transistor Q901 enters the OFF state and the relay returns to N.O. to terminate the auto-degaussing operation is completed.

3.1.2. Suspend Mode Operation

Two feedback ratios can be selected, both sensing from the 75V rail. In the event of Q909 being turned on by micro processor, additional current is drawn from the virtual earth node of IC902, thus causing the power supply to serve the rail to a high voltage, nominally 75V. This is trimmed by resistor R951, R956 and VR901. The other supply rail are predetermined ratios of this winging, being +15V, +12V, 6.3V and 180V nominally. In addition, a low voltage primary side winding feeds the control IC901 directly through D902 turning off the control IC901 supply through Q903, which would otherwise dissipate excessively.

When Q909 is turned off, the 75V rail drop to around 17V. In this case, the primary control supply fed through D902 drops to a value that is below the level needed to sustain operation. Instead, Q903 begins to conduct and the higher voltage supply winding taken via D903 is used to keep the primary side powered up with minimal power losses.

The 5V power supply is driven by one of two sources. In normal operation when the 75V is present, the 5V regulator, IC904 is fed from the 15V rail through diode D921. When switched to standby mode (75V rail drops to 12V) then the 15V rail drops too low to supply IC904. In this case Q908 take over and maintains the supply to IC904 at around 9V.

In addition to the 5V regulated supply, in normal operation there is also a 15V regulated supply take from the 15V rail.

To ensure that micro processor gets a good 5V power supply, there is a power good detection circuit formed by Q701 and Q702. This monitors the supply going into the 5V rail (not the 5V rail directly). It detects whether there is sufficient voltage to enable the 5V regulator to work effectively. It is not a detection of the 5V rail itself, but relies upon the premise that the regulator is not faulty and that there is no faulty load condition on the 5V.

During power up, there is a delay to the signal at the output of the threshold comparator Q701 and Q702 a caused by ZD701 and C701, in order to allow the micro circuit time to stabilize. The threshold is chosen such that the RESET line drops low at least 25ms before the 5V drop out of regulation.

Finally a synchronization pulse taken from the horizontal output stage maintains the SMPS operating frequency in sync with the horizontal scan. D910 injects a pulse which prematurely triggers the oscillator within IC901 which would otherwise run at a frequency lower than the minimum required sync frequency.

3.1.3. DC to DC Circuit

Another special characteristic of this power supply is the addition of a DC to DC circuit to the output. In order to support the monitor at different frequencies a similar high voltage is required (26kV). To accommodate this requirement, a buck loop has been added to the 180V output. The synchronization signal is got from the monitor H-DRIVER area and after getting synchronization through Q601 trigger pin 2 of IC601, a high voltage feedback signal (FB) is input to Q605 to obtain the DC level. A comparison is carried out between pin 5 of IC601 and IC602 to establish the duty cycle of transistor Q606 so that even under different frequencies, a similar high voltage value is still obtained.

3.2. The Deflection Circuit

Please refer to the block diagram of the deflection circuit and video circuit and Logic circuit as shown in figure 3-2.

3.2.1. IC301 LM1290 autosync Horizontal Deflection Processor

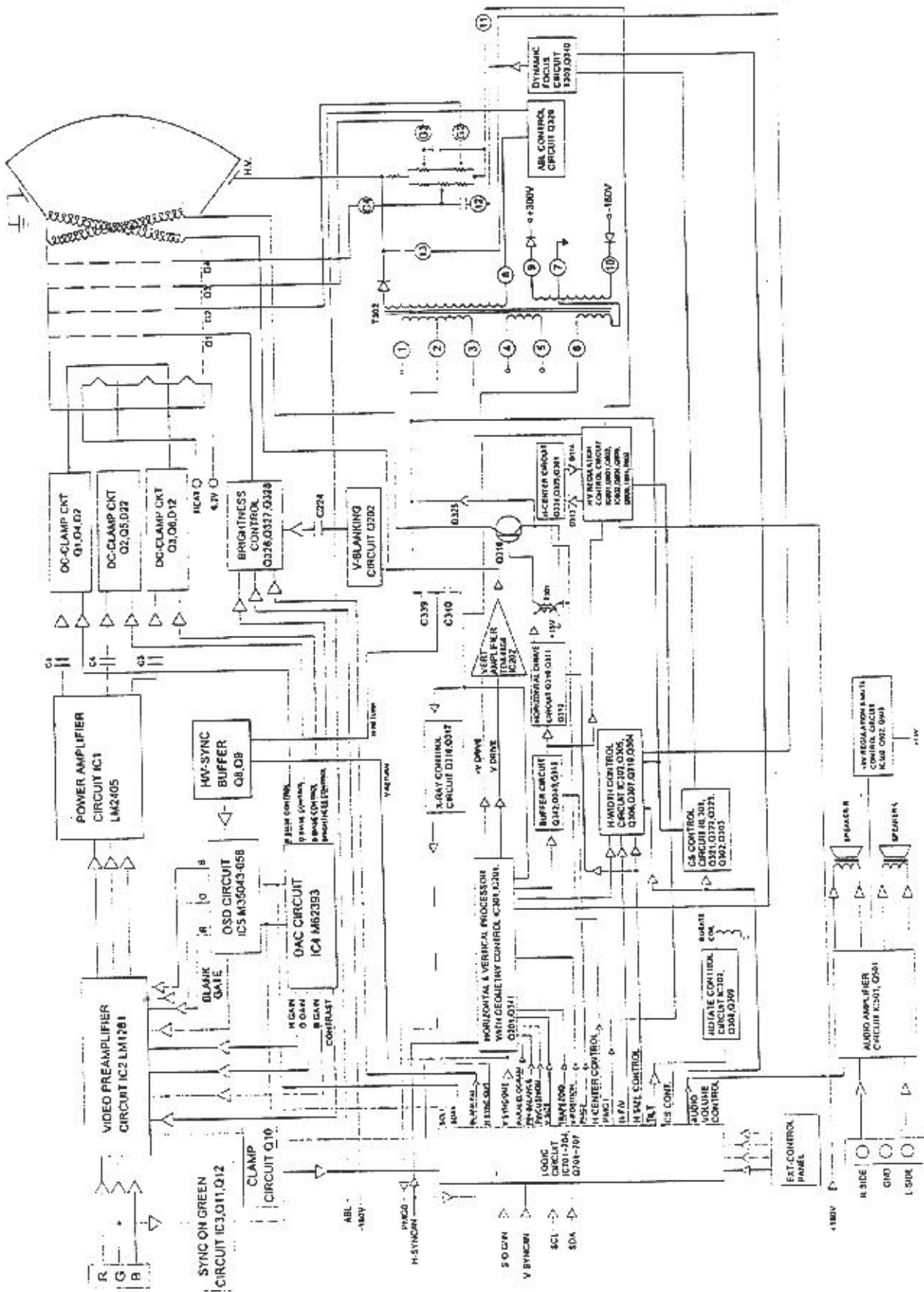

Figure 3-2 Video,Logic,Audio and Deflection Block Diagram

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The LM1290 provides full autosync capability, DC controls and complete freedom from manufacturing trims. Its continuous capture range is from 30kHz to 70kHz. Mode change frequency ramping, for protection of horizontal deflection output transistor, is programmable by using an external capacitor.

The design uses an on-chip FVC (Frequency to Voltage Converter) to set the center frequency of the VCO (Voltage Controlled Oscillator). This technique allows autosync operation over the entire frequency range using just one optimized set of external components.

The system includes a second phase detector which compensates for storage time variation in the horizontal output transistor, the picture's horizontal position is thus independent of temperature and component variance.

The LM1290 provides DC control pins for H drive duty cycle and flyback phase.

3.2.2. IC301 LM1290 Descriptions

Pin 1 F-Min:
A resistor from this pin to ground sets the lower frequency limit of the VCO. the lower frequency limit is approximately:

$$1.63 \times 10^3 + \frac{4.38 \times 10^8}{(Rmin + 500)} Hz$$

Pin 2 H-HV Polarity:
A C315 capacitor is connected from this pin to ground for detecting the polarity of H/HV sync at pin 3. A low logic level at pin 2 indicates active high H/HV sync to pin 3, a high level indicates active low.

Pin 3 H/HV Sync:
This input pin accepts DC-coupled H or composite sync of either polarity. For best noise immunity, a resistor of R342 or less should be connected from this pin to pin 8 (GND) via a short path.

Pin 4 Duty Cycle:

A DC voltage applied to this pin sets the duty cycle of the H-DRIVE output (pin 7), with a range of approximately 30% to 70%. 2V sets the duty cycle to 50%.

Pin 5 X-ray:
This pin is for monitoring CRT anode voltage. If the input voltage exceeds an internal threshold, H-DRIVE output (pin 7) is latched high. Vcc has to be reduced to below approximately 2V to clear the latched condition. I.E power must be turned off.

Pin 6 Flycack:
Input pin for phase detector 2. For best operation, the flyback peak should be at least 5V but not greater than Vcc. Any pulse width greater than 1.5us is acceptable.

Pin 7 H-DRIVE:
This is an open-collector output which provides the drive pulse for the high power deflection circuit. The pulse duty cycle is controlled by pin 4. Polarity convention, Horizontal deflection output transistor is on when H-DRIVE out is low.

Pin 8 Ground:
System ground. For best jitter performance, all LM1290 filter components and bypass capacitors should be connected to this pin via short paths.

Pin 9 Phase Detector 2 Filter:
The low pass filter capacitor (C325) for the output of phase detecte 2 is connected from this pin to pin 8 (GND) via short path.

Pin 10 Phase:
A AC control voltage applied to this pin sets the phase of the flyblack pulse with respect to the center of H-sync.

Pin 11 FVC Filter:
A capacitor (C322) is connected from this pin to pin 8 (GND) via a short path.

Pin 12 Phase Detector 1 OUT/VCO IN:
Phase detector 1 has a gated charge pump output which requires an external low-pass filter. For best jitter performance, the filter should be grounded to pin 8 (GND) via a short path. If a voltage source is applied to this pin, the phase detector is disabled and the VCO can be controlled directly.

Pin 13 Vref:
This is the decoupling pin for the internal 8.2V reference. It sould be decoupled to pin 8 (GND) via a short path with a capacitor of C320 and C321. Then Vcc a pulse width greater than 1.5us is acceptable.

Pin 14 Vcc:
12V nominal power supply pin. This pin should be decoupled to pin 8 (GND) via a short path with a capacitor of C205.

3.2.3. IC201 LM1295 DC Controlled Geometry Correction System

The LM1295 is specifically designed for use in a continuous sync monitor. The injection-locked vertical oscillator operates from 50 Hz to 120 Hz, covering all known video monitors. A differential ouptut current is provided in order to prevent ground interaction.

The IC201 provides two outputs composed of the summation of DC controlled 1st and 2nd order ouptut terms. The first ouptut corrects for EW pincushion and trapezoid. The second corrects for parallelogram and bow.

A DC controlled output is provided for vertical dynamic focus correction.

3.2.4. IC201 LM1295 Pin Descriptions

Pin 1 Ground:
This pin should be connected to the power ground at pin 17.

Pin 2 Vertical Height:
A Voltage between 0V and 4V on this pin controls the amplitude of the +V and -V drive currents, with increas-

ing voltage giving increasing current. The control range is approximately 1.8 to 1. The response time is low, being limited by the automatic level control loop.

Pin 3 4V CAP:
A C203 capacitor aluminum electrolytic or tantalum, should be connected between pin 3 and GND to bypass the internal 4V reference.

Pin 4 Vertical Sync In:
The vertical sync input takes a negative-going TTL level pulse which injection locks the vertical oscillator to the vertical sync frequency if it is above the LM1295 minimum frequency. The minimum pulse width is approximately 200Ns. For free-running detection (no vertical sync in), this input should be at logic high.

Pin 5 8V CAP:
A C204 capacitor, aluminum electrolytic or tantalum, should be connected between pin 5 and GND (pin 17) to bypass the internal 8V reference.

Pin 6 Vertical Dynamic Heigh:
A voltage between 3V and 4V on this pin controls the amplitude of the +V and -V drive currents with increasing voltage giving increasing current. The control range is approximately 1.3 to 1.

Pin 7 Vcc:
Vcc should be bypassed to GND (pin 17) with a C205 aluminum electrolytic or tantalum capacitor. The supply voltage is 12V.

Pin 8 Voltage Reference CAP:
A C206 capacitor aluminum electrolytic or tantalum, should be connected between pin 8 and GND (pin 17).

Pin 9 Horizontal Dynamic width:
This output consists of the sum of the vertical ramp and the parabola derived from the ramp. The amplitude and polarity of the ramp signal is DC controlled by horizontal trapezoid control (pin 11) and of the parabola by E-W pin control (pin 10). The weighting of lthe ramp is 1/3 the parabola; i.e, with the horizontal trapezoid and E-W pincushion controls at 4V, the output is 3 parts parabola and 1 part ramp. Horizontal dynamic width is used to correct for trapezoid and east-west pincushion distortion.

Pin 10 E-W Pincushion Control:
A voltage of 0V to 4V adjusts the polarity and the amount of parabola in the horizontal dynamic width (pin 9) output. At approximately 2V, the amount is zero. From 2V to 4V, the amplitude increases and the parabola is positive-going. From 2V to 0V, the amplitude increases and the parabola is negative-going.

Pin 11 Horizontal Trapezoid Control:
A voltage of 0V to 4V adjusts the polarity and the amount of vertical ramp in the horizontal dynamic width (pin 9) output. At approximately 2V, the amount is zero. From 2V to 4V, the amplitude increases and the ramp is positive-going. From 2V to 0V, the amplitude increases and the ramp is negative-going.

Pin 12 Horizontal parallelogram control:
A voltage of 0V to 4V adjusts the polarity and the amount of vertical ramp in the horizontal dynamic center (pin 14) output. At approximately 2V, the amount is zero. From 2V to 4V, the amplitude increases and the ramp is positive-going. From 2V to 0V, the amplitude increases and the ramp is negative-going.

Pin 13 Horizontal Bow Control:
A voltage of 0V to 4V adjusts the polarity and the amount of parabola in the horizontal dynamic center (pin 14) output. At approximately 2V, the amount is zero. From 2V to 4V, the amplitude increases and the parabola is positive-going. From 2V to 0V, the amplitude increases and the parabola is negative-going.

Pin 14 Horizontal Dynamic Center:
This output consists of the sum of the vertical ramp and the parabola derived from the ramp. The amplitude and polarity of the ramp signal is DC controlled by horizontal parallelogram control (pin 12) and of the parabola by horizontal BOW control (pin 13). The difference between this output and the horizontal dynamic width output is in the weighting of the ramp, which is equal to the parabola; i.e with the horizontal parallelogram and horizontal BOW controls at 4V, the output is 1 part parabola and 1 part ramp. Horizontal dynamic center is used to correct for parallelogram and bow distortion.

Pin 15 Vertical Dynamic Focus Control:
A voltage of 0V to 4V adjusts the polarity and the amount of parabola in the vertical dynamic focus (pin 16) output. At approximately 2V, the amount is zero. From 2V to 4V , the amplitude increases and the parabola is positive-going. From 2V to 0V, the amplitue increases and the parabola is negative-going..

Pin 16 Vertical Dynamic Focus:
This output consists of the parabola derived from the vertical ramp. The amplitude and polarity are controlled by vertical dynamic focus control.

Pin 17 Ground:
This is the power supply ground for the 12V supply and the point to which the bypass capacitors are returned.

Pin 18 Automatic Level Control CAP:
This capacitor (C212) is part of the level control circuit that maintains constant vertical height in spite of vertical sync frequency changes. If the VCO capacitor value is changed, the capacitor value should change in the same ratio. A R216 resistor should be connected from this pin to ground.

Pin 19 Double Frequency Capacitor:
This capacitor (C211) prevents the vertical oscillator from locking at twice the vertical sync frequency. If the VCO capacitor value is changed, this capacitor value should change in the same ratio.

Pin 20 Oscillator Capacitor:
This is the vertical oscillator capacitor (C210). The value can be changed to change the minimum frequency.

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Pin 21 Vertical Resistor:
One end of the vertical resistor connects to this pin. This resistor determines the gain of the vertical ramp current generator. The gain is inversely proportional to the resistance.

Pin 22 Vertical Resistor:
The other end of the vertical resistor connects to this pin.

Pin 23 - Vertical Drive:
This is the negative-going vertical ramp output current of the differential pair. The ramp current waveform is superimposed on a direct current of approximately 315μA. The waveform amplitude is determined by the vertical height (pin 2) control voltage and the vertical dynamic (pin 6) control voltage. The current can be converted into voltage by a resistor to ground or by a differential amplifier using the differential currents as inputs. The voltage compliance of the output is typically 6V.

Pin 24 + Vertical Drive:
This is the same as vertical drive except it is the positive-going output current of the differential pair.

3.2.5. Vertical Deflection Circuit

1. IC202 TDA4866 consists of a flyback generator, voltage stabilizer, drive circuit and vertical output amplifier.

2. **The vertical oscillator circuit**

   (a) The frequency and phase of the vertical oscillator circuit is generated by the vertical synchronization signal.

   (b) The synchronization signal is input from Pin 4 of IC201 LM1295, and after being processed by the synchronization circuit, is sent to the vertical synchronization oscillator circuit to trigger the vertical oscillator and synchronize the oscillator frequency with the external synchronization signal. The frequency of its internal free oscillation is set by the time constant of C210. It does not need an external F/V control because this IC201 can keep vertical synchronization. Pin 18 provides vertical A.L.C function. So the pin 18 of IC201 is use to maintain the difference between the free oscillation frequency and external synchonization signal frequency at a similar level and make the sawtooth wave amplitude from pin 23 and pin 24 of IC201 the same.

3. **Vertical Size Control**

   The pulse voltage output by the oscillator is sent to the sawtooth wave generator. The size and amplitude of the voltage of the sawtooth wave generation can be changed by DC value which output from Pin 35 of IC701 (PWM) and the vertical size can thus be controlled. This sawtooth wave voltage passes through a buffer and is output from pin 23 and pin 24 of IC201 to pin 1 and pin 2 of IC202 TDA4866 of the vertical drive circuit.

   The vertical ramp and DC offset are also controlled by PWM output. The vertical ramp generated across C210 is buffered internally to IC201 by DC controlled variable gain stage. The voltage level is derived from pin 35 of IC701 (PWM) through the R729, R207 and C727 of grneration, then into pin 2 of IC201.

4. **Vertical Drive Circuit**

   (a) It is not sufficient to rely solely on the oscillator circuit output to ensure the stability of the vertical output, so a first or second level amplifier circuit must be inserted between the oscillator circuit and the output. This circuit is called the drive amplifier and in addition to amplifying the sawtooth wave also corrects the vertical linearity.

   After adding the drive circuit, because the level of amplification can be considerable, enough negative feedback can be added to correct vertical linearity and increase the stability of the circuit.

   (b) If the current of the sawtooth wave flowing through the deflection yoke is distorted, then the top and bottom portions of the display will be expanded or compressed, resulting in poor linearity. In order to solve this problem, correction of the linearity of the sawtooth wave can be carried out before the drive level.

5. **IC202 TDA4866 Vertical Drive Circuit**

   The IC202 TDA4866 consists of a differential input stage, two output stages, a flyback generator a protection circuit for the output stages and a guard circuit.

   In order that the current output stage accurate DC reference, a DC reference voltage is taken from pin 5 of IC201. This used as the reference voltage (via divider resistors, R224 and R225) for the current signals coupled power amplifier IC202. This is a simple voltage to current inverting amplifier, using R230 to derive a voltage proportional to the current in the deflection winding of the yoke. This voltage is fed back to the virtual signal earth inverting input of the power amplifier(pin9) by R227. This back to back diode feedback network modifies the linearity of the transfer characteristic in order to give precept "S" correction linearity, in addition to the variable correction in the ramp generator.

6. **Vertical Centering Adjustment**

   Since IC202 functions as a CMRR circuit, VDC is output from pin 4 and pin 6 of IC202, so the central current can be changed to shift the on-screen display up or down to prevent

voltage fluctuation. After adjusting the power stabilizer at pin 21 and pin 22 of IC201 by R215. This is input to Pin 21 and pin 22 of IC201 to change the value of the vertical center.

The DC operating point of the amplifier can be varied by the pin 38 of IC701 (vertical position) output and via R726, C724 and R236 to pin 21 and pin 22 of IC201 which adds or subtracts an offset into the output, thus varying the DC offset of the scan and hence the vertical centering.

3.2.6. Geometry Correction Circuit

1. If the width of the border in the center of the screen is insufficient, the waveform shown in Figure 3-3 below, can be used to add to horizontal deflection B+ in order to change the deflection of the horizontal deflection circuit. This waveform is the parabola obtained after regulation of the vertical period, and is created to perform amplitude modulation on the horizontal deflection current, as shown in Figure 3-4.

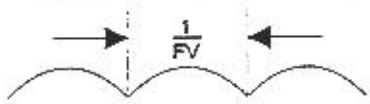
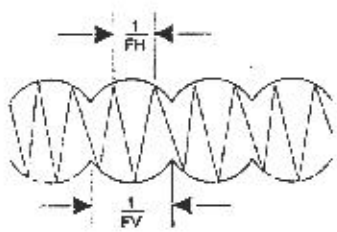


Figure 3-3 Voltage Correction Wave



FH: Horizontal Frequency
FV: Vertical Frequency

Figure 3-4 Current Correction Wave

2. The sawtooth wave is output from Pin 9 of IC201 and through C304 and R315 and input to Pin 2 of IC302 (H-size control circuit). It is then output from Pin 1 of IC302 and after passing though the buffer collector of Q305, output to Q306 and Q307, added to horizontal current to provide pincushion and trapezoid distortion correction. So, is created to preform amplitude modulation on the horizontal deflection output pluse, as shown in figure 3-5.

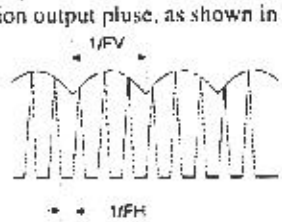


Figure 3-5 Collector of Q307 Output Pluse Correction Wave

3. The sawtooth wave is output from pin 14 of IC201 and through R237 and C225 and input to pin 10 of IC301. It is added to horizontal phase to provide parallelogram and bow distortion correction.

3.2.7. Structure of Horizontal Deflection Circuit

The function of the horizontal deflection circuit is to cause left/right scanning of the electron beam using the sawtooth wave current flowing through the horizontal deflection yoke, and is made up of the horizontal oscillator circuit, horizontal drive circuit, horizontal output circuit, synchronous AFC circuit and high voltage generator circuit.

1. **Horizontal Drive Amplifier**
In order to rapidly saturate the output transistor (ON) or cut it off (OFF), a sufficient basic current must be provided. Because of this, an amplifier circuit is added between the oscillator circuit and the output circuit to amplify the pulse voltage. At the same time, after the waveform has been regulated, by adding this circuit to the output circuit, this amplification circuit functions as a drive amplifier.

IC301 LM1290 consists of a horizontal sync selection polarity circuit, composite video sync stripper circuit, AFC circuit, H/V sync and composite sync circuit, voltage control oscillator circuit, phase regulator circuit, X-Ray circuit, voltage regulator circuit and horizontal drive duty cycle circuit.

When the synchronization signal input to logic circuit and pin 3 of IC301. The pin 7 of IC301 output horizontal frequency is achieved by the pin 1 of IC701 and flyback pulse from pin 6 of T302 (A.F.C) fed to pin 6 of IC301. So, the pin 7 of IC301 output horizontal frequency through Q342, Q343, Q312 and T301 provide a horizontal deflection output transistor base current of Q318.

The horizontal output transistor base drive is taken from a conventional base drive transformer stage. This circuit as in a similar manner to a flyback power supply. The square wave horizontal oscillator output signal is coupled into the base drive stage transistor Q310, Q311 and Q312 turns on connects the primary winding of transformer T301 across the +15V supplies. This causes the primary current to increase linearly until such time as Q312 turns off, hence storing a predetermined amount of flux energy in the transformer. As Q312 turns off, and the primary current falls to zero, the secondary voltage is driven above the threshold of the base-emitter junction voltage of the horizontal output transistor Q318. Current flows through R385, R386, R368, R369, R370 and D306 into the base of Q318 hence turning this

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device on. The high base current of around 1.1A. Lamps is so high that Q318 is driven heavily into saturation. This is important in order that the collector voltage should be as low as low as possible whilst conducting the high peak currents that flow through the horizontal deflection winding. In turn, this is vital to limit dissipation.

At the required time as determined by the horizontal oscillator, the base drive transistor is turned back on. The voltage at Q312 collector fall rapidly back towards the ground rail. However, the secondary current still remains flowing in a positive direction for a short time, due to the finite leakage inductance of T301. Also, due to the heavy saturation of Q318, the base voltage remains at around 1V. The current in the secondary winding rapidly reverses and goes sharply negative as the charge stored within the base region of Q318 is removed. D306 helps to speed up this charge removal. Note that during this time, the collector output of the Q318 is still turned on, even though the base current is flowing out of the base.

This period of time is known as the storage time of the device and may take between 2-3us, depending upon peak collector current and temperature and various other design factors. Finally, when all charge in the base region of Q318 is dissipated the base current suddenly stops, and the secondary current drops almost instantly to zero. At that point, the device now become non-conducting and the collector current flow also terminates. The secondary voltage on T301 drops to it's unloaded voltage and the current flow in the primary settles to it initial value once more.

2. **Horizontal Equivalent Output Circuit**
The horizontal output circuit uses the switch operation of a transistor and a damping diode, and provides a sawtooth wave current to the deflection yoke. The horizontal deflection yoke is made up of the L value on the coil and resistance r inside the coil connected in series. Its resistance is extremely small, and the time constant (L/r) is extremely large. Because of this the voltage at the two terminals of the coil cause rapid variation in the current flowing in the coil still will slowly vary, creating a sawtooth current. The basic circuit and equivalent circuit are shown in Figures 3-6 and 3-7.

3. **Horizontal Output Equivalent Circuit Operation**
Refer to Figure 3-8 for the current wave of the voltage of the horizontal output circuit during operation.

(a) t1 — t2 Period
The base of the output transistor is added to the forward bias voltage. As the current through

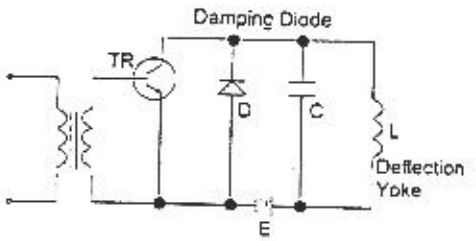

Figure 3-6 The Basic Deflection Circuit

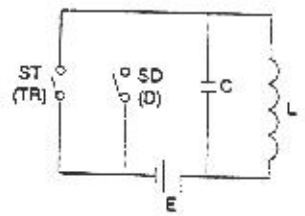

Figure 3-7 Equivalent Circuit

the base is very large, it will cause the output transistor to be saturated, corresponding to the ON state of S1 in the equivalent circuit. At this time the deflection yoke contains a current flow and because the time constant is large, the current will slowly show a linear increase as shown in Figures 3-8 (b) and 3-9 (a).

(b) t2-t3 Period
At t2, a negative load is applied to the base and the output transistor changes to OFF (S1 in open state). There is no current passing through the transistor at this time and the L and C components of the deflection yoke become independent oscillation circuits. If the current is suddenly cut off, then the polarity of the inverse voltage generated at L will be as shown in Figure 3-9 (b). This voltage is viewed as the source voltage and will cause current to flow, at which time the current flowing to C is as shown in Figure 3-8 (d). At time t3 this current is 0 but the voltage at the two capacitor terminals is at maximum. This waveform is known as flyback pulse, and is shown in Figure 3-8 (f).

(c) (t3 — t4) Period
The energy accumulated in C is released to the deflection yoke, the direction of the current flow being shown in Figure 3-9 (c). The current increases as the voltage on C decreases, and at time t4, the voltage of C is 0, at which time the current is at maximum, which means the current flowing into the deflection yoke is also maximum. C is then charged and if a damping resistor is not connected, the energy between L and C will be reversed, which is the oscillation frequency set by the oscillator at L and C.

(d) t4 — t5 Period
At t4, the voltage of C is 0. After this it is

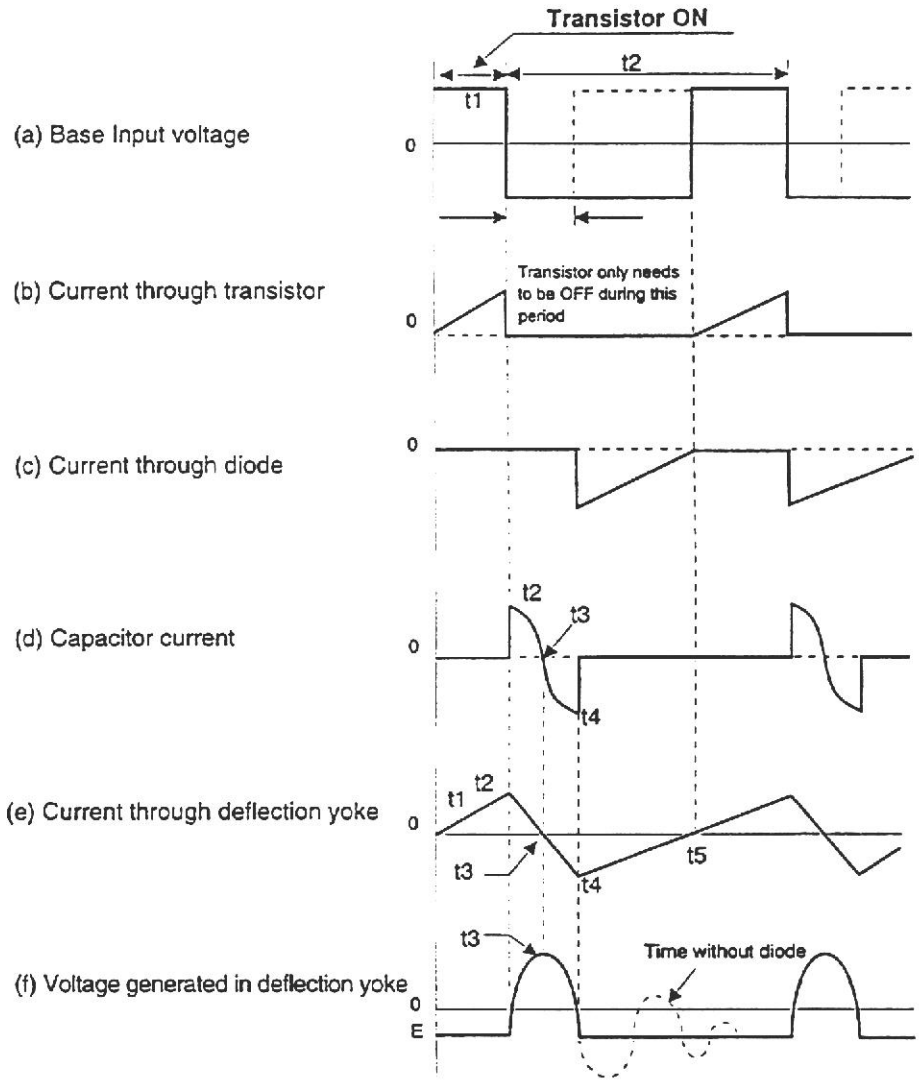

Figure 3-8 Horizontal Output Voltage/Current Waves

recharged in the opposite direction and this voltage exceeds the voltage of the power source at time t4. At this time the damping diode is ON and the L and C circuits are shorted out and stop oscillating. Because of this the time constant of r and L in the damping diode is large so the current flowing in the deflection yoke does not suddenly become 0. The current shows a linear decrease, and when it becomes 0 at time t5 the transistor is ON and the operation described above is repeated.

As described above, the current flowing in the deflection yoke during scanning is the sum of the current which has passed through the transistor and the damping diode current. Please refer to Figure 3-8 (e).

4. **Horizontal output operation:**
The actual output stage differs from the simple model described in a number of ways. Refer to the basic schematic of the major components in Figure 3-10 on the following page.

The main inductance L is now divided into the primary winding of the flyback transformer T302 and the deflection yoke winding. The deflection yoke is coupled through a capacitor C343, which has two function. Primarily it prevents DC unwanted DC currents flowing through the deflection yoke which would otherwise cause an undesirable deflection of the CRT beam.

Secondly, the voltage drop across it due to the AC ramp current flowing causes a parabolic modulation in the slope of the ramp, leading to a progressive curve in the ramp, symmetrical about the zero current value as shown in Figure 3-11. This intentional distortion of the linear ramp is required to compensate for the 'S', or symmetric linearity distortion in the CRT.

In series with C343 and the deflection yoke is another indicter, L305. This is a saturating indictor that is biased with a permanent magnet. Consequently this device has a linearity that is

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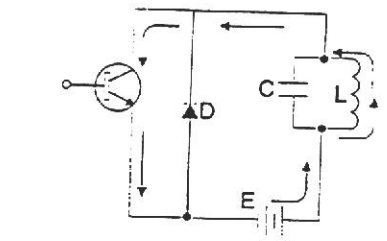
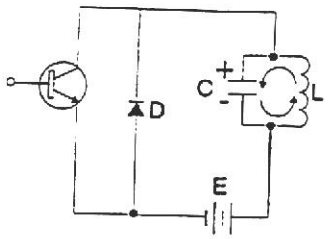
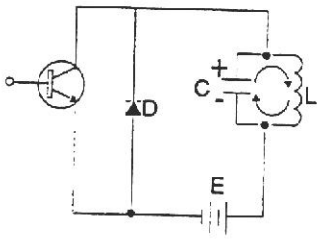


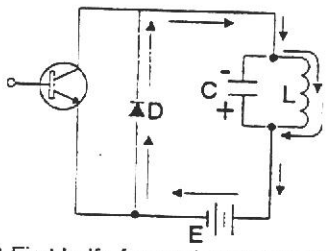
(a) Second half of scanning period (t1 - t2)



(b) First half of return line period (t2 - t3)



(c) Second half of return line period (t3 - t4).



(d) First half of scanning period (t4 - t5)

Figure 3-9 Polarity of Transformer Voltage

higher for current flow in one direction than in the opposite direction. This function provides compensation for resistive losses that would otherwise cause an undesirable exponential curve to the linear ramp, resulting in asymmetrical linearity errors in the displayed image.

The voltage seen in the output stage require special attention. The B+ supply can varying between 60-180V. The main flyback pulse seen across Q318 and associated components is around 1100Vp. Consequently, appropriate precautionary measures must be taken when servicing the monitor.

In addition to the basic topology as described above, there are a number of other additional devices. Q321, RL301 and Q323 can be independently turned on or off under logic control. These devices switch addition capacitors, C342, C345 and C346 in parallel with C343 to alter the amount of 'S' correction at different horizontal scan frequencies.

Q324 and Q325 acts as a constant current source that can be under Q301 by the logic control. This current source drives an adjustable constant current via L301 into L303. This current flows into the deflection yoke and adds a variable DC offset to allow image raster centering to be achieved.

The B+ supply is configured so as to maintain a constant anode voltage. The anode voltage is derived from the flyback transformer (T302). As the flyback voltage across the primary is already a high voltage pulse of around 1.2V, it requires only a modest turns ratio to step this

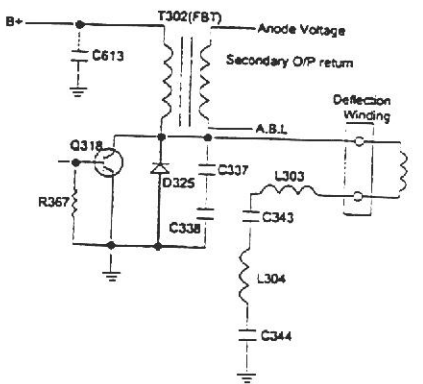


Figure 3-10 Basic Horizontal Deflection Output Circuit

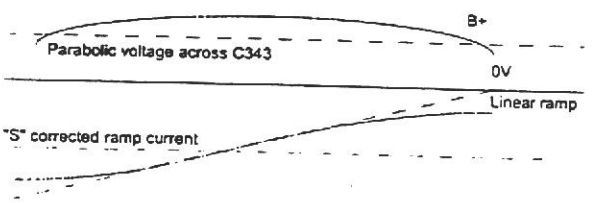


Figure 3-11 Linear Ramp Distortion

pulse up to around 26kV, the working voltage of the C.R.T.

The flyback pulse at the primary of T302 is proportional to the both frequency and the supply rail B+. In order to maintain the anode voltage at a constant 26kV a regulation system is required. This is achieved using a buck regulation stage formed by a IC601 driving a Q606, synchronized by the horizontal oscillator. The

IC601 has an error amplifier that generates an error signal from the feedback network formed by the high voltage bleed resistor and capactior (it is internal to T302). Resistors VR601, R617 and R616 set the DC feedback ratio, and by adjustment of VR601, this ratio can be adjusted at setup to set the high voltage at it's nominal value of 26kV. The AC frequency response of the serve loop is set by C609 and R618 for optimum stability and relegation characteristics.

The output of the error amplifier which can be observed on pin 5 of IC601 is internally compared with a DC voltage. This DC is produced across. C614 charge by R604. The voltage across this capacitor is periodically discharged by Q601 which is fed by a pulse from the horizontal drice via R601 and R602. This pulse is triger IC601 and getting the synchrunization.

In the event of the horizontal oscillator stopping as occurs during mode change etc, the ramp generator stops functioning, this prevents operation of the horizontal output stage immediately after the oscillator has stopped in order to protect Q318 from excessive voltage.

IC601 compares the ramp in pin 2 with the error voltage on pin 5 and produces a pulse width modulated output on pin 3. This output drives through a small pulse transformer (T601) to the gate of the FET (Q606). This device acts as the power switch to the buck regulation stage, the inductor T602 acting as the storage element.

During mode change, the B+ supply can be instantly turned off by pulling up the error amplifier input on pin 5 and pin 4. These can be achieved by Q602 and Q604 which is driven from the logic signal PMG1. Whilst Q602 and Q604 can switch off the B+ supply almost instantly, the time taken for the supply to restart is programmed by the value of C603. This capacitor slowly discharges when Q604 is turned off, thus allowing the B+ voltage to follow an exponential rising charge curve, set by the value of C603 and R606.

The average beam current through the CRT also flows through the secondary high voltage winding of T302 connected to pin 8 of T302, C363 smooths the pulse of current flowing in the secondary winding and the average DC current is supplies through resistor R3A0, R3A4 and VR301. Pin 8 is clamped between 5V and ground by D317. When no anode current is flowing, the voltage at pin 8 is at the clamp voltage of 5.5V. When the average secondary current flowing exceed 460uA, this voltage begins to drop below this threshold. Thus a signal is generated which can be fed to video amplifier for automatic beam current limiting (ABL). This is fed into the error amplifier. A PWM signal is used to drive a switching FET(Q606) which drop the voltage down to maintain a constant EHT, the DC operting point of which is adjusted by VR601. The horizontal output stage is a conventional diode modulator type.

3.2.8. Horizontal Size Control Circuit

The different PWM value output from pin36 and pin 37 of IC701 passes through the distributed voltage from R728, C726, R727, C725, R301, R302, R303 and VR303 achieves one fixed DC value which is sent to pin 3 of IC302, so the VDC from pin 36 and pin 37 of IC701 is not the same, causing pin 1 of IC302 to output a different DC value, after passing through the buffer collector of Q305, output to Q306 and Q307. Darlington current amplification through L304 to adjust the current through H-DY's current value achieving size control.

In addition, width control is achieved by adding a DC offset to the output current at Q305 collector proportional to the PWM outputs on pin 36 and pin 37 of IC701. This DC voltage is switched for a constant period by FBT(T302) which is driven by the ramp derived from pin 13 of the FBT. The resultant output is a current pulse of constant width, which is then averaged by the capacitor C360. In this way a voltage proportional to frequency is gained as the reference for the noninverting input of the diode modulator pre-amplifier. This in turn will ensure that the width of the scan produced on the screen is constant for all frequencies of operation for any given PWM output.

3.2.9. X-RAY Protection Circuit

The feedback pulse voltage from T302(F.B.T) is regulated through D319 to obtain a DC voltage and the appropriate set voltage is distributed by R364 and VR302. When the feedback pulse voltage exceeds the set voltage, a DC voltage develops in the cathode of ZD303 which turns on Q316 and Q317. As a result, the base of Q909 to 0V, so Q909 is turned off and into power saving mode. This is the phenomenon of high voltage protection.

3.2.10. The Focus Circuit

The output waveform come from pin 16 of IC201 through C366 and R3A6 to the amplifier Q340, via T303 with horizontal waveform to modulation. After, the wave coupling of the T302 which make the focus performance on the C.R.T. This is waveform shown in figure 3-12.

3.2.11. Rotate Control

Similarly, output pin 34 of IC701 drive through R3C2, R730, C728 and R322 to control pin 5 of

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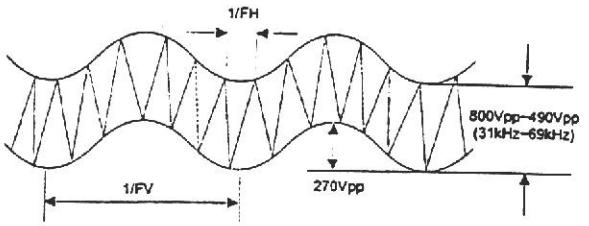


Figure 3-12 Focus Correction Wave

IC302 and then output of pin 7 of IC302 via Q308 and Q309 to achieved rotate adjustment.

3.2.12. Horizontal linearity and CS Switching

Switching CS is necessary to ensure the lines are in accordance with the specifications in multi-sync monitors.

- For frequencies 55~69kHz, Q321, Q322 and RL301 are OFF, so CS is only C343, but L303 and L305 are in parallel.
- For frequencies 42~55kHz, Q322 and RL301 are OFF, Q321 is ON, so CS are C343 and C342 in parallel, but L303 and L305 are in parallel.
- For frequencies 34~42kHz, Q321 is OFF, Q322 and RL301 are ON, so CS are C343 and C345 in parallel, but linear coil is only L303.
- For frequencies 29~34kHz, Q321, Q322 and RL301 are ON, so CS are C343, C342 and C345 in parallel, but linear coil is only L303.

Truth Table of Frequency Discriminator				
FEQ CS	29~34 kHz	34~42 kHz	42~55 kHz	55~69 kHz
CS1	L	H	L	H
CS2	H	H	L	L
CS0	H	H	H	H

Truth Table of Power Saving Detector						
Mode	H-sync	V-sync	PMG0	PMG1	PMG2	Blanking
ON	Pulse	Pulse	1	0	0	0
Standby	No Pulse	Pulse	1	1	1	1
Suspend	Pulse	No Pulse	0	1	1	1
OFF	No Pulse	No Pulse	0	1	1	1
Mode change	X	X	1	⎍	0	⎍

3.3. Audio Amplifier Circuit

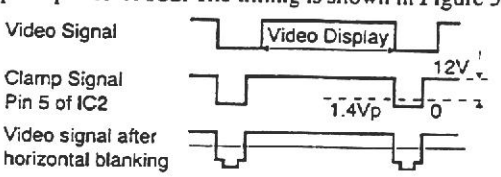
IC501 TDA7057AQ consists of a pre-amplifier and power output amplifier circuit. The R/L audio signals are supplied through a P502 directly to the main board at connector to pin 3 and pin 5 of IC501. The separate gain control voltage for the two pre-amplifier channels are provided by pin 3 of IC701 through Q501. It can providing variable voltage on the pin 1 and pin 7 of IC501. The audio signals output of power amplifier pin 8 and pin 13 of IC501 and via the speaker return to pin 11 and pin 10 of IC501.

3.4. Video Amplifier

The RGB video and sync signals are supplied through a video cable directly to the Video Board at connector P1. The RGB signals are terminated in 75 ohms by R39 and R42, R38.

The RGB signals then enter an IC2 LM1281 video pre-amplifier, providing synchronous black level clamping, variable picture contrast (gain) and RGB gain balance for alignment. Separate gain control voltages for the three pre-amplifier channels are provided via R34, R33 and R32 from the IC4 M62393 DAC which is loaded by the microcontroller via the I2C bus. These inputs enable the individual gains of each channel to be varied to allow channel gain balance. In addition, a common signal is applied on pin13 of IC2 to adjust all three channels by the same amount, to allow for overall gain or contrast control.

A synchronous clamping signal is derived from the horizontal sync pulse by Q10. This takes the trailing edge of the horizontal sync pulse, differentiates it through C39 and R53, which is applied pin 15 of IC2. The timing is shown in Figure 3-13.



NOTE:
A. Clamp signal is generated from horizontal sync pulse time.
B. When the Clamp signal is less than 1.4Vp-p, the IC's internal clamp loop will operate; when greater than 1.4Vp-p, it will not operate.

Figure 3-13 Timing of Pin 15 Clamp Signal

The outputs of the video pre-amplifier are fed to IC1, a hybrid power amplifier IC type LM2405, through resistors R21, R23 and R25. In addition, on screen display video information generated by IC2 can be injected via R28, R29 and R27 through pin 1, pin 2, and pin 3 of IC2.

IC1 amplifies the video signals to around 40Vpp. The outputs are AC coupled to the CRT cathodes via C1, C4 and C3. In order to bias the DC level of the cathodes correctly, the AC coupled signal is DC restored by clamping to a DC voltage which can be varied under microprocessor control. Considering Red channel output on IC1 as an example, the signal is clamped by D2 to the voltage set by the transistor amplifiers formed by Q1, which amplify the adjustable voltage at the output of the DAC. A similar stage can be seen for the green and blue channel outputs.

When the RC video signal amplification circuit is added for amplification, this waveform will change as shown in Figure 3-14 (a). Without the DC component, as shown in Figure 3-14 (b), the DC level of darker and brighter displays will be different, so when this kind of signal without a DC component

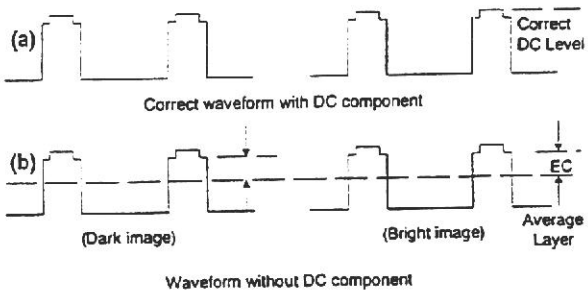


Figure 3-14 The Post Output Amplifier Circuit

is sent to the CRT, it will cause the contrast of the image to change as the signal changes. Therefore Q1, Q2, Q3, Q4, Q5, Q6 and D2, D22, D12 serve as a DC clamp and the CRT's cathodes DC voltage can be adjusted by the pin 13, pin 14, pin 15 of IC4 M62393 DAC.

IC5 is an On Screen Display processor. This is a simple video generation IC5 that has its own oscillator circuit. The oscillator circuit by using an internal Phase Locked Loop (PLL) the IC5 can sync to the incoming vertical and horizontal oscillator circuit by using an internal Phase Locked Loop (PLL) the IC5 can sync to the incoming vertical and horizontal D22 the IC2 bus. When the OSD display is activated, the blanking output of the IC5 also sends a signal to the blanking input of IC2 (pin 4) to provide an optional black background for the OSD display.

The RGB signals are amplified to drive the CRT by an IC1 LM2405 hybrid amplifier and capacitively coupled to the cathodes.

Brightness control is achieved by varying the bias of G1 of the CRT via a transistor stage formed by Q328 which is also driven by an output of the pin 12 of IC4. Vertical blanking signals is coupled into this amplifier Q202 to prevent visible retrace lines.

3.5. Microprocessor And Sync Processing

The microprocessor is a MC68HC05BD5P type. It is particularly suitable as multisync computer monitor controller. This 8-bit microcontroller unit (MCU) contains an onchip oscillator, CPU, RAM, ROM, M-Bus serial interface system (IIC), parallel I/O, Pulse Width Modulator, Multi-Function Timer and sync Signal Processor. It has a 7.75k bytes of ROM and 256 bytes of RAM on internal which contains a basic communication 'boot' routine and various other simple routines. It is also used to store the OSD icon bit map. The main firmware routines and variable data stored in the 16k external EEROM, IC703.

When the micro is instructed via the IC2 bus, the internal ROM boot routine will load up the EEROM with program data from the IC2 bus. Thus it can be made to load its own firmware. From then on it will run jointly out of EEROM and internal ROM. Another important routine within the internal ROM is the routine which allows data writes to be made to the EEROM. This must be resident in the micro as it cannot run from the EEROM whilst writing data. These control the addressing and I/O port selection from the micro CPU in the IC701 (MC68HC05BD5P).

Also specialized ports Pin16, Pin 17 and Pin18 of IC701 form the M-Bus interface which is used internally to set the DAC valuse and the OSD IC and CS table control IC (IC701). Other way, specialized ports pin 11 and pin 12 of IC701 from the M-bus interface which is used internally to set the data to external EEROM IC703. In addition, the I/O ports from pin 19 to pin 23 of IC701 from the M-bus interface which is used internally to set the front panel control.

There are 16 PWM channel. Channel 0 to channel 7 are dedicated PWM channels while channel 8 to channel 15 are shared with ports C under the control of the corresponding configuration register. Thus it can be made to control H-PHASE, PARALLELOGRM, PIN-BALANCE, TRAPEZOID, PINCUSHION, TILT, V-SIZE, H-SIZE and V-POSITION on the pin 1, pin 26, pin 27, pin 28, pin 29, pin 34, pin 35, pin 36, pin 37 and pin 38 of IC701.

The micro also drives the sync selection circuits. IC701 is used to set the polarity of the incoming sync signals and allows the micro to sample the vertical and horizontal syncs and to select the correct polarity on the outputs H-SYNC and V-SYNC appropriately. In addition, whilst sampling the polarity, the micro can measure the frequency of both syncs. By suitable selection of H-SYNC and V-SYNC control lines, it does this when ever a mode change occurs. A mode change is detected by either a change in vertical frequency, which is monitored by firmware, or by a sudden change in horizontal frequency.

When power is disturbed to the unit, the power reset line goes low. This also causes an input to the micro via the MODEC line. On detecting this interrupt, the micro first checks inputs Pin 4 of IC701. If these are also low, then it knows the MODEC interrupt was caused by an impending power failure. In this case the micro saves the current RAM data in EEROM and prepares for power off. The RESET line is delayed for 7ms by R701, ZD701, R703 and C701 to allow time for the data to be saved. The REST line then holds off the micro and the EEROM until power is good once more.

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Section 4.
Setup Adjustments

4.1. Preparing the Display for Adjustment 4-1
4.2. Adjustment Procedures 4-1
4.3. High Voltage Verification 4-2
4.4. X-ray Protection Check 4-2
4.5. G1 Voltage Adjustment 4-2
4.6. Background Brightness Setting 4-2
4.7. Screen Brightness Adjustment 4-2
4.8. Magnetic Field Configuration 4-3
4.9. Tilt Verification 4-3
4.10. Focus Verification 4-3
4.11. Color Misconvergence 4-3
4.12. Primary Test Mode Performance Adjustment 4-3
4.13. Performance Adjustments for All Preset Mode 4-3
4.14. Image Performance Verifications 4-3
4.15. Uniformity Verification 4-4
4.16. Brightness Verification 4-4
4.17. Display Size Stability 4-4
4.18. Color Purity Verification 4-4
4.19. Video Noise 4-4
4.20. Power Saving Check 4-4
4.21. Audio Power Amplifier Check 4-4
4.22. DDC 1/2 Data Wirting 4-4

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4.1. Preparing the Display for Adjustment

Before adjusting any the display settings or making final adjustments after service, perform the following pre-test settings to prepare the display for adjustment:

1. Be sure to allow the display to warm up for at least 30 minutes before making any adjustments.
2. When making tests and adjustments, the CRT should be facing east or west to minimize the affect of the earth's magnetic field.
3. Set the contrast control at 80% and the brightness control at 50% for all tests unless otherwise specified.
4. Thoroughly degauss the entire screen with a manual degausser before proceeding with tests.
5. All test should be performed with the rated power supply voltage unless otherwise specified.

4.1.1. Test Equipment Required

The following equipment will be required to make the tests and adjustments detailed in this section:

- ☐ Video signal and pattern generator
- ☐ Digital multimeter
- ☐ Degausser

4.2. Adjustment Procedures

4.2.1. Adjustment Sequence

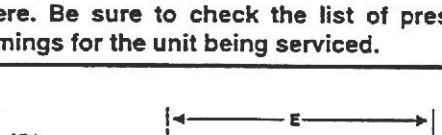
This display undergoes an automatic alignement procedure during manufacture. This alignment procedure follows a fixed sequence of adjustments which are dupplicated in this section. When making manual adjustments during service, you should always make the adjustments in the order given here to ensure correct results.

4.2.2. Preset Timings Used During Adjustment

During alignment it is necessary to input certian preset timings stored in the display. The detailed parameters of all the preset timings are given in the table below for your reference.

IMPORTANT NOTE

The preset timings for different versions of this model may differ from those shown here. Be sure to check the list of preset timings for the unit being serviced.



Mode Number	Mode 1	Mode 2	Mode 3	Mode 4	Mode 5	Mode 6
Data Pixel	640	800	1024	1280	640	1024
Data Line	480	600	768	1024	400	768
H. Freq.(kHz)	37.500	46.875	60.023	63.980	31.469	60.241
V. Freq(Hz)	75.000	75.000	75.000	60.010	59.942	74.927
Pixel Rate(MHz)	31.500	49.500	78.750	110.550	25.175	80.000
Hor. FP µs(A)	0.508	0.323	0.203	0.434	0.636	0.400
Hor. Sync µs(B)	2.032	1.616	1.219	1.737	3.813	1.200
Hor. BP µs(C)	3.810	3.232	2.235	1.882	1.907	2.200
Hor. Active µs(D)	20.317	16.162	13.003	11.578	25.422	12.800
Hor. Total µs(E)	26.667	21.333	16.660	15.631	31.778	16.600
Ver. FP ms(A)	0.027	0.021	0.017	0.032	0.381	0.050
Ver. Sync ms(B)	0.080	0.064	0.050	0.063	0.064	0.050
Ver. BP ms(C)	0.427	0.448	0.466	0.563	1.048	0.498
Ver. Active ms(D)	12.800	12.800	12.795	16.006	15.253	12.749
Ver. Total ms(E)	13.333	13.333	13.328	16.663	16.683	13.346
Polarity(H.V)	-,-	+,+	+,+	+,+	-,-	-,-
Primary mode is 60.023kHz / 75.000Hz (1024x768)						

Table 4-1 Table of preset Timing Parameters

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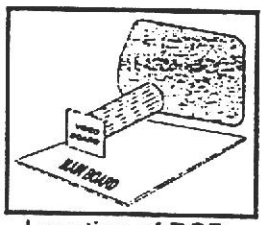
IMPORTANT NOTE

The adjustment settings in this section are based on REVISION E of the factory alignment procedures. Appendices detailing changes in the factory alignment procedures that have occurred since publication of this service manual are available upon request.

Initial settings to be carried out manually prior to automatic alignment:

4.3. High Voltage Verification

1. Input a cross hatch pattern in primary mode and check that the 75V voltage is 75V± 0.3. If not in specification range and adjust VR901 (see figure 4-1 for approximate location) to correct voltage is in the range 75V±0.3.
2. Input a cross hatch pattern in primary mode and turn the VR302 to end with counterclockwise, the adjust VR601 (see figure 4-1 for approximate location) to get the high voltage is in the range 26kV±0.2.
3. Input a full white pattern in 31.47kHz (640×480) mode, and check that the high voltage is in the range 26kV±0.2.
4. Input a full white pattern in 31.47kHz (640×480) mode, and press the external button to make horizontal size to minimum, then adjust VR303 on the main board (see figure 4-1 for approximate location) so the horizontal size is in the range 255mm±2.



Location of PCBs

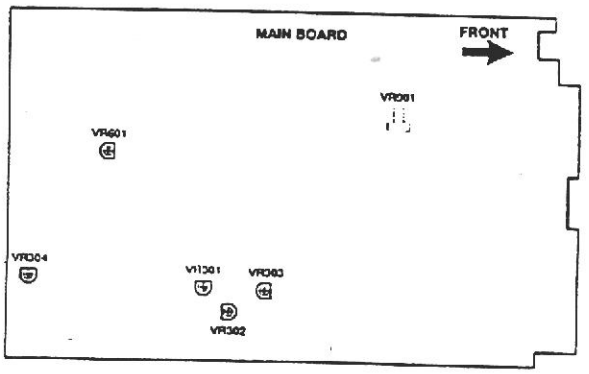


Figure 4-1 Location of on Main board & Neck board

4.4. X-ray Protection Check

1. Input a cross hatch pattern in primary mode, and adjust VR302 (see figure 4-1 for approximate location) to make the voltage at negative polarity of ZD303 is 11.5V±0.2, than trun the VR601 to check high voltage at between 28.5kV~30.5kV shall be shut-down, the X-ray protection circuit is operation.
2. Return the VR601 with turn OFF/ON the monitor and readjust VR601 to get the high voltage is in the range 26kV±0.2.

4.5. G1 Voltage Adjustment

Input a raster pattern (video OFF) in primary mode and push the external brightness control button to maximum. Check the G1 voltage is in the range -45V±1.

Steps used in white balance adjustment:

4.6. Background Brightness Setting

1. Input a raster pattern in primary mode and push the external brightness control button to maximum. Adjust the SCREEN VR so background brightness is approximately 1.0FL±0.1.
2. Before carrying out white balance adjustment, make sure that the display size and linearity are in spec.
3. Before carrying out white balance adjustment, make sure that the VR301 (see Figure 4-1 for approximate location) position shall be turn clockwise to the end (ABL no action).
4. Input timing in primary mode, and the white balance automatic adjust some item as blow.
   a) Input no video pattern in primary mode, and set-up brightness of raster white balance get the x,y value is x=0.346±0.01 y=0.359±0.01.
   b) Input a full white pattern in primary mode, and set-up 5000 degrees kelvin of picture white balance get the x,y value is x=0.346±0.01 y=0.359±0.01.
   c) Input a full white pattern in primary mode, and set-up 6500 degrees kelvin of picture white balance get the x,y value is x=0.313±0.01 y=0.329±0.01.
   d) Input a full white pattern in primary mode, and set-up 9300 degrees kelvin of picture white balance get the x,y value is x=0.283±0.01 y=0.298±0.01.

4.7. Screen Brightness Adjustment

1. Input a raster pattern in primary mode. Set external brightness key to maximum and external contrast key to

minimum, then make sure that the raster brightness range is 1.0FL±0.2. If not in this range, and adjust screen VR of F.B.T.

2. Input a raster pattern (video OFF) in primary mode. Set external contrast key to maximum and push external brightness key to brightness is 0.08FL (cut OFF), then switch to a display of full white pattern and from CAS set-up internal contrast gain and check that brightness at the center of the screen is in the range 33FL±1.
3. Input a full white pattern in primary mode. Set external brightness and contrast key to maximum. Adjust VR301 and check that brightness at the center of the screen is in the range 38FL±1.

Conclusion White Balance Adjustment:

4.8. Magnetic Field Configuration

Configure the magnetic field as follows:

- Northern hemisphere : H=0.01, V=0.45
- Southern hemisphere : H=0.01, V=-0.52

4.9. Tilt Verification

Input a cross hatch pattern in primary mode and use the tilt rotation key to ensure that tilt is less than 1mm.

4.10. Focus Verification

1. Input a full white pattern in primary mode. Use the external brightness control to adjust background brightness so it is not visible and set external contrast so the brightness is 30FL, then switch to a display of cross hatch pattern.
2. Adjust the FBT focus VR1 and VR2 so the vertical line and horizontal line are as clear as possible.
3. Input a "o" characters pattern in primary mode and check "o" characters is clearest.

4.11. Color Misconvergence

1. Input a full white pattern in primary mode and adjust external brightness so there is no background brightness and external contrast so the screen brightness is 30FL.
2. Switch to a cross hatch pattern and verify that misconvergence in a circle measured from the center of the screen (Area A) is not greater than 0.3mm, and for all areas outside Area A is not greater than 0.4mm.
3. If not in the specification, as following as below items.
   a) Used the 4 pole and 6 pole magnetic in a C.R.T center adjustments for arrive to better color convergence.
   b) After used the magnetic in a four corner adjustments for arrive to better color convergence.

Automatic camera alignment procedure:

The procedures listed below are those carried out using the automatic Camera Alignment System (CAS). These adjustments cannot be made manually but must be performed using the CAS software provided by the manufacturer.

4.12. Primary Test Mode Performance Adjustments

1. **V. RASTER CENTERING**
   Raster area centered vertically in the bezel.
2. **H. RASTER CENTERING**
   Raster area centered vertically in the bezel
3. **ROTATION (TILT)**
   Raster area aligned with bezel.

4.13. Performance Adjustments for All Preset Modes

1. **H POSITION**
   Centers the picture display horizontally in the bezel area ($|L-R| \leq 1$mm).
2. **H SIZE**
   Configures picture display width as 300±3mm.
3. **V POSITION**
   Centers the picture display vertically in the bezel area ($|T-B| \leq 1$mm).
4. **V SIZE**
   Configures picture display height as 225±3mm.
5. **V Linearity**
   Configures vertical linearity as less than 8%.
6. **Rotation**
   Configures picture display rotation as less than 1mm.
7. **Pin-Balance**
   Sets left and right pin-balance distortion to less than 1.5mm.
8. **PINCUSHION**
   Sets left and right pincushion distortion to less than 1.5mm.
9. **Trapezium**
   Sets upper and lower trapezium distortion to less than 1.5mm.
10. **Parallelogram**
    Sets parallelogram distortion to less than 1.5mm.

Conclusion of automatic alignment:

4.14. Image Performance Verification

Input each of the preset timings and check that the following specifications are met:

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1. **Horizontal Position**
   |L-R| ≤3.5mm
2. **Horizontal Size**
   300±3.5mm
3. **Vertical Position**
   |T-B| ≤3mm
4. **Vertical Size**
   225±3mm
5. **Horizontal Linearity**
   H≤10% (10 x 8 cross hatch pattern)
   This calculation is based on the following formula:

   $$\frac{Max - Min}{Max} \times 100\% \leq 10\%, \text{ primary mode} \leq 8\%$$

6. **Vertical Linearity**
   V≤8.0% (10x8 cross hatch pattern).

   $$\frac{Max - Min}{Max} \times 100\% \leq 8\%$$

7. **Geometric Edge Distortion**
   All geometrics distortion shall be less than as below:
   Horizontal line ≤2mm
   Vertical line ≤2mm
8. **Recall Button Function**
   Adjust H/V phase and size at random using the external controls and press the recall button. Check that the image performance has returned to be in spec, which will indicate the recall button is functioning correctly.

4.15. Uniformity Verification

Input a 2" square pattern in primary mode, set contrast to maximum and check that there is no overshoot. Check that the brightness in the four corners of the screen is not less than 70% of that in the center of the screen.

4.16. Brightness Verification

1. Input a raster pattern (no video pattern) in primary mode. Adjust external brightness to 0.08FL (cut OFF).
2. Input a full white pattern and adjust external contrast to maximum then check that brightness at the center of the screen shall be more than 30FL. Adjust external brightness to maximum and check that brightness at the center of the screen is less 36FL.

4.17. Display Size Stability

Inputer a full white pattern in primary mode, set external brightness at 5FL and measure the display size. Adjust the brightness to 30FL and remeasure the display size. The difference should be less than 2mm.

4.18. Color Purity Verification

1. Input a full white pattern in primary mode and adjust external brightness so there is no background brightness and adjust external contrast to 25FL. Make a visual check of color purity as follows:
   a) Input the red (R) signal only; no green (G) or blue (B) should be visible.
   b) Input the green (G) signal only; no red (R) or blue (B) should be visible.
   c) Input the blue (B) signal only; no red (R) or green (G) should be visible.

4.19. Video Noise

Input a cross hatch pattern or full white pattern in primary mode and make a visual check from a distance of 18 inches for any video noise or other on-screen interference.

4.20. Power Saving Check

1. Input cross hatch pattern in primary mode.
2. Turn OFF H-Sync signal, the power indicator LED have to change the emitting color from green to orange, then turn ON H-Sync signal again, the picture shall be visible.
3. Turn OFF V-Sync signal, the power indicator LED have to change the emitting color from green to orange, then turn ON V-Sync signal again, the picture shall be visible.
4. Turn OFF H/V-Sync signal, the power indicator LED have to change the emitting color from green to orange, then turn ON H/V-Sync signal again, the picture shall be visible.

4.21. Audio Power Amplifier Check

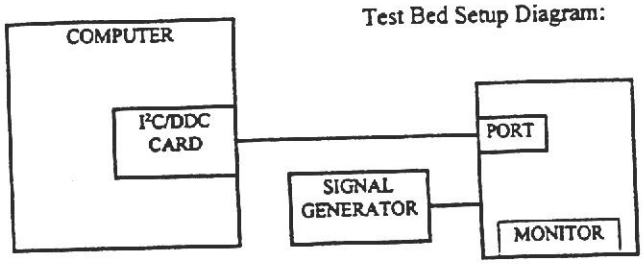
1. Input audio signal from the audio signal generator to U.U.T of the audio in R/L side.
2. Push L-side switch on fixture and check the U.U.T of the L-side speaker out.
3. Push R-side switch on fixture and check the U.U.T of the R-side speaker out.
4. Push L/R-side switch on fixture and check the U.U.T of the L/R-side speaker out.
5. Push phone switch on fixture and check the U.U.T of the phone jack out.

4.22. DDC 1/2 Data Writing

Writing the DDC 1/2 data in EEROM.

4.23 Software Adjustment Procedure

Test Bed Setup Diagram:



1. Install software into EA771 directory
2. Install I²C/DDC card into computer
3. Connect cable to I²C/DDC card and programming port of monitor
4. Connect signal generator
5. Turn on monitor
6. Run the adjustment program

DETAILED PROCEDURE TO BE PROVIDED AS A SUPPLEMENT TO THIS MANUAL

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Section 5.
Troubleshooting

5.1. No Display at Power-on 5-1
5.2. No X-ray Operation 5-2
5.3. No Video Operation 5-3
5.4. Poor Vertical Linearity 5-4
5.5. Poor Horizontal Linearity 5-5
5.6. Poor Uniformity 5-6
5.7. Tilted Display Area 5-7
5.8. Misconvergence 5-8
5.9. Poor Regulation 5-9
5.10. Poor Focus 5-10
5.11. Poor Geometry Distortion 5-11
5.12. No Audio Amplifier 5-12

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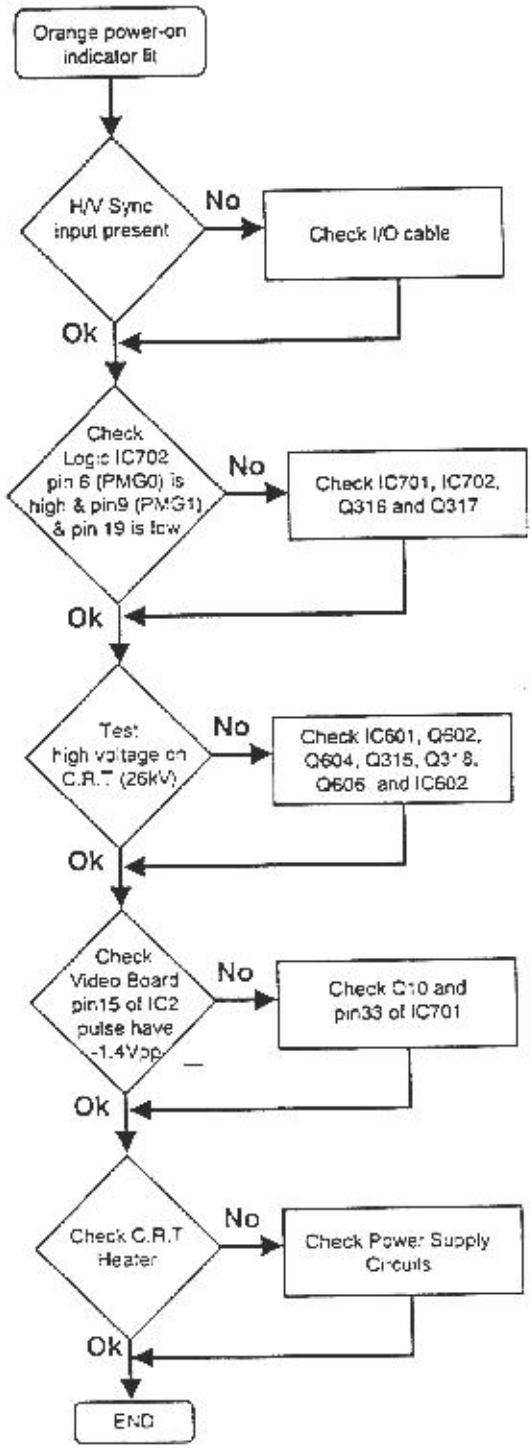
5.1. No Display at Power-on



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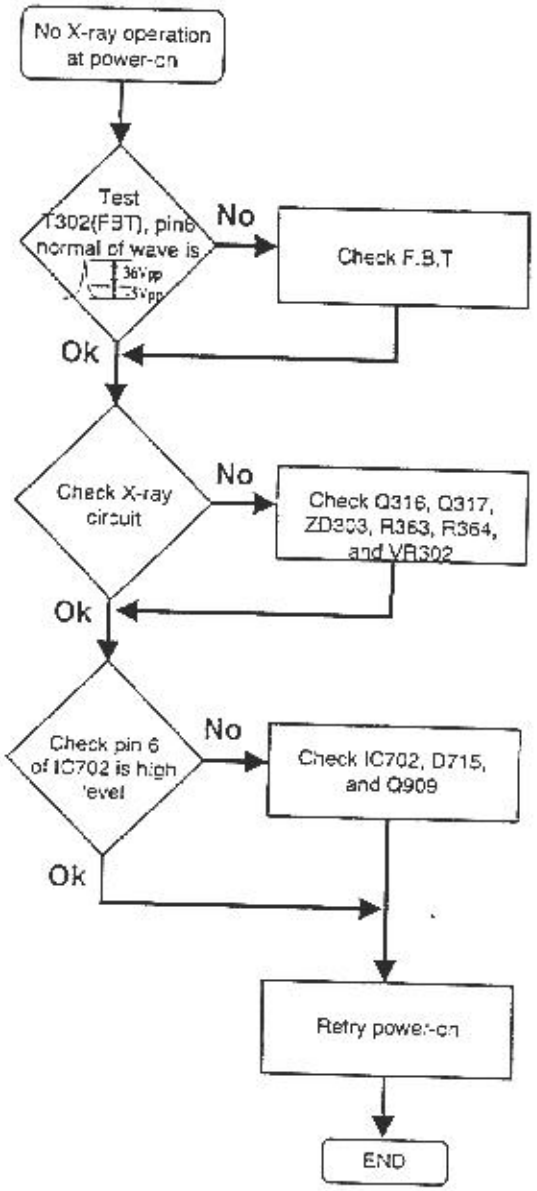
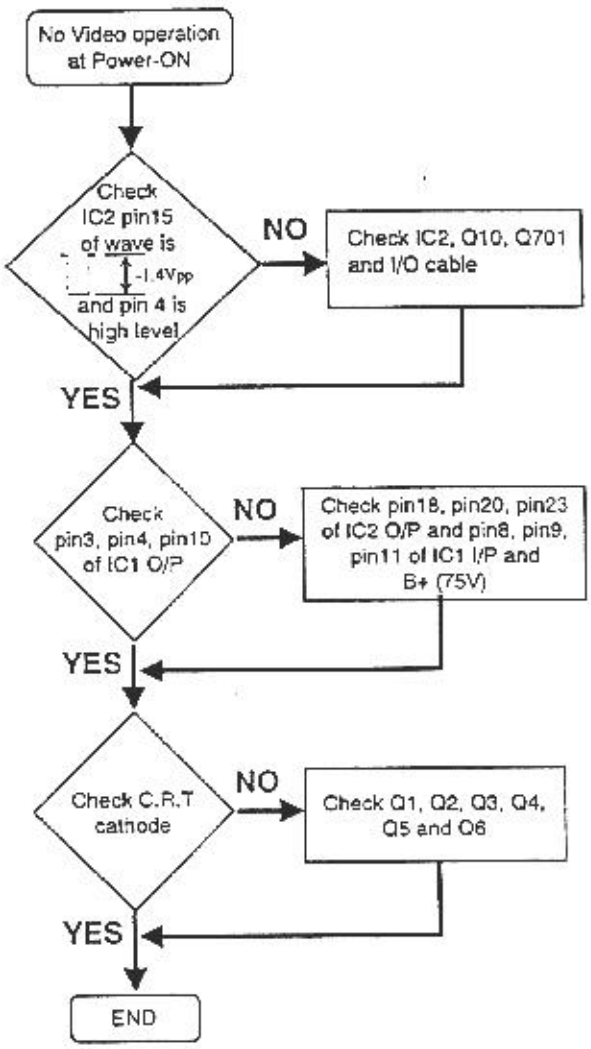
5.2. No X-ray Operation



5.3. No Video Operation


No Video operation at Power-ON
Check IC2 pin15 of wave is ~1.4Vpp and pin 4 is high level
NO
Check IC2, Q10, Q701 and I/O cable
YES
Check pin3, pin4, pin10 of IC1 O/P
NO
Check pin18, pin20, pin23 of IC2 O/P and pin8, pin9, pin11 of IC1 I/P and B+ (75V)
YES
Check C.R.T cathode
NO
Check Q1, Q2, Q3, Q4, Q5 and Q6
YES
END

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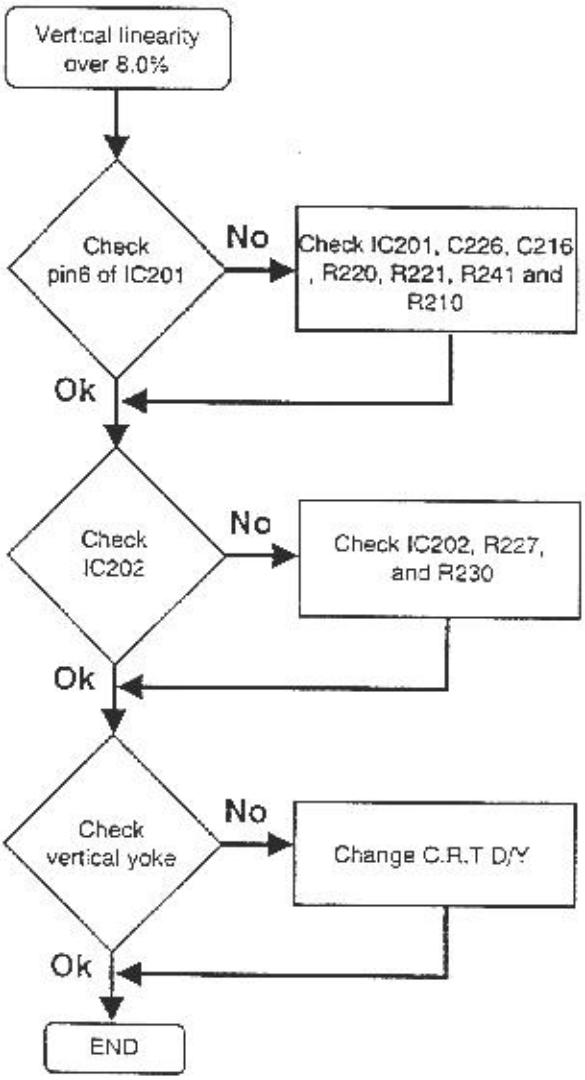
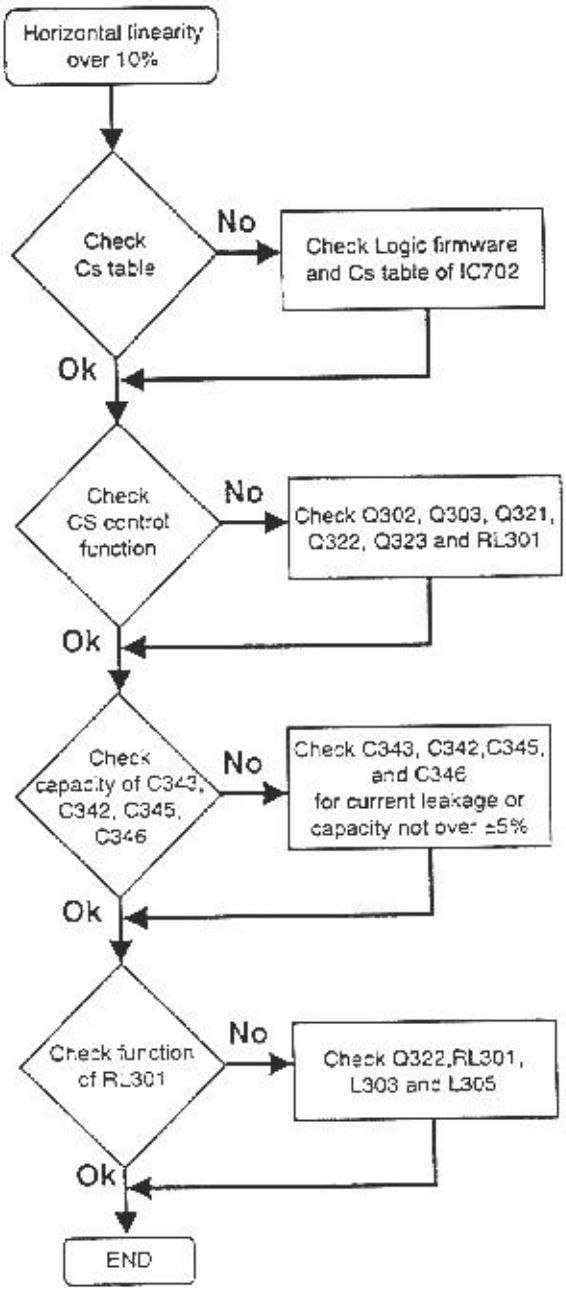
5.4. Poor Vertical Linearity



5.5. Poor Horizontal Linearity



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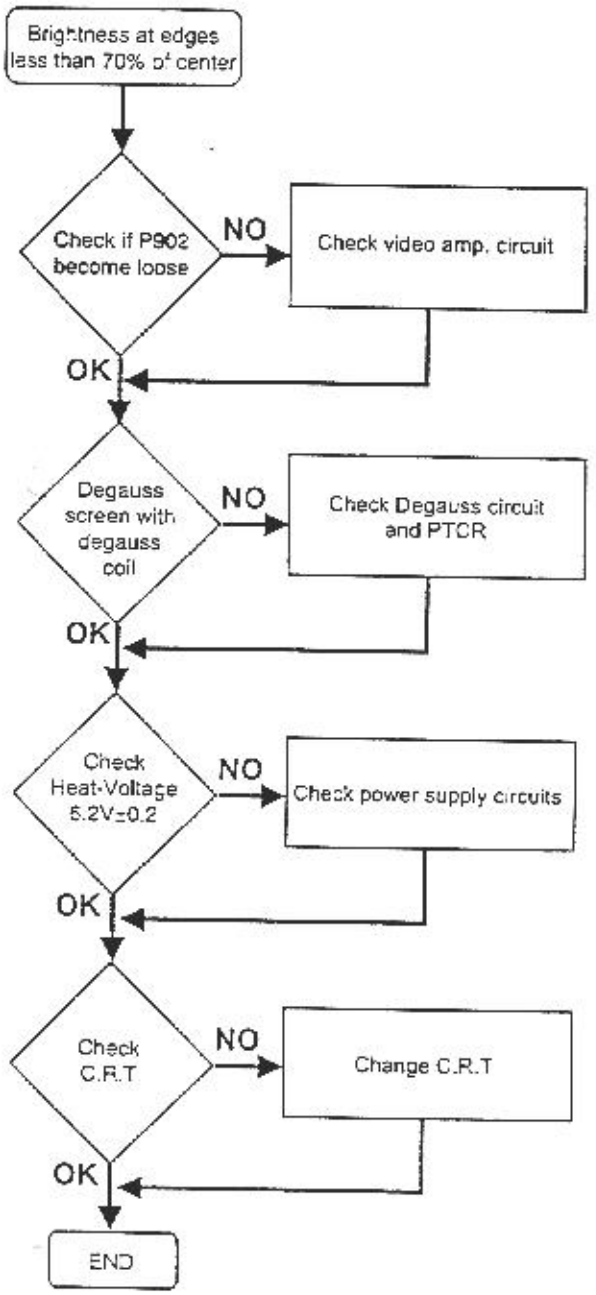
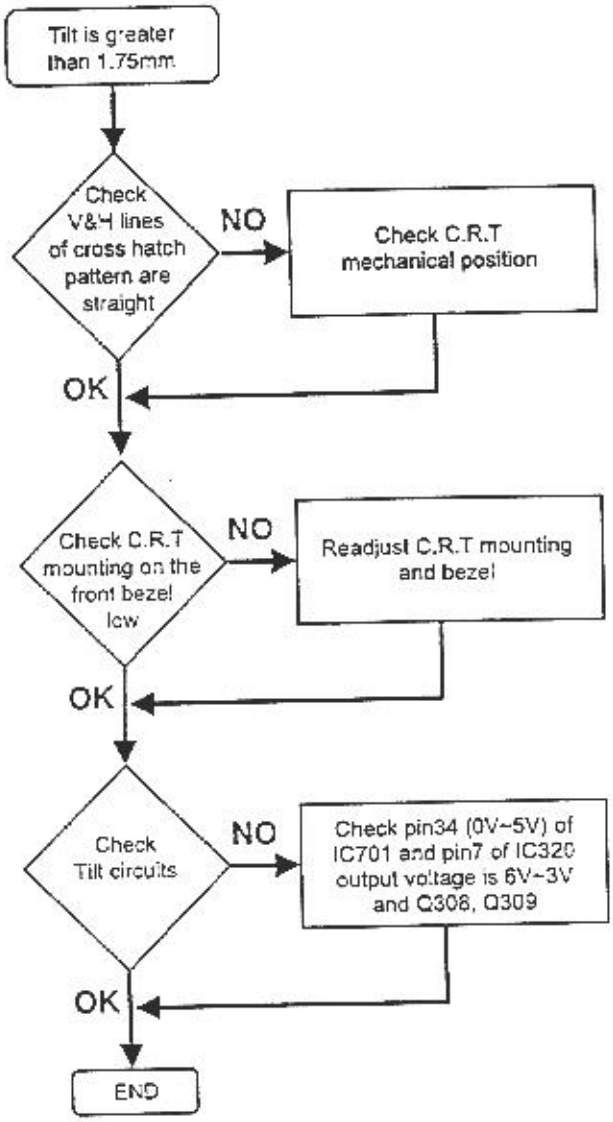
5.6. Poor Uniformity



5.7. Tilted Display Area


Tilt is greater than 1.75mm
Check V&H lines of cross hatch pattern are straight
NO
Check C.R.T mechanical position
OK
Check C.R.T mounting on the front bezel low
NO
Readjust C.R.T mounting and bezel
OK
Check Tilt circuits
NO
Check pin34 (0V~5V) of IC701 and pin7 of IC320 output voltage is 6V~3V and Q308, Q309
OK
END

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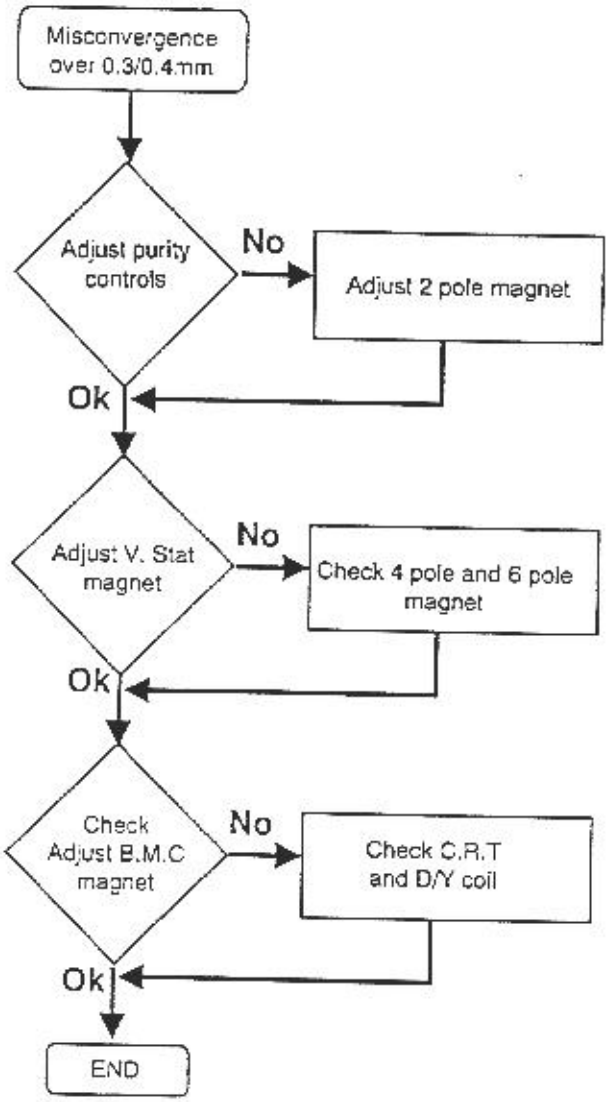
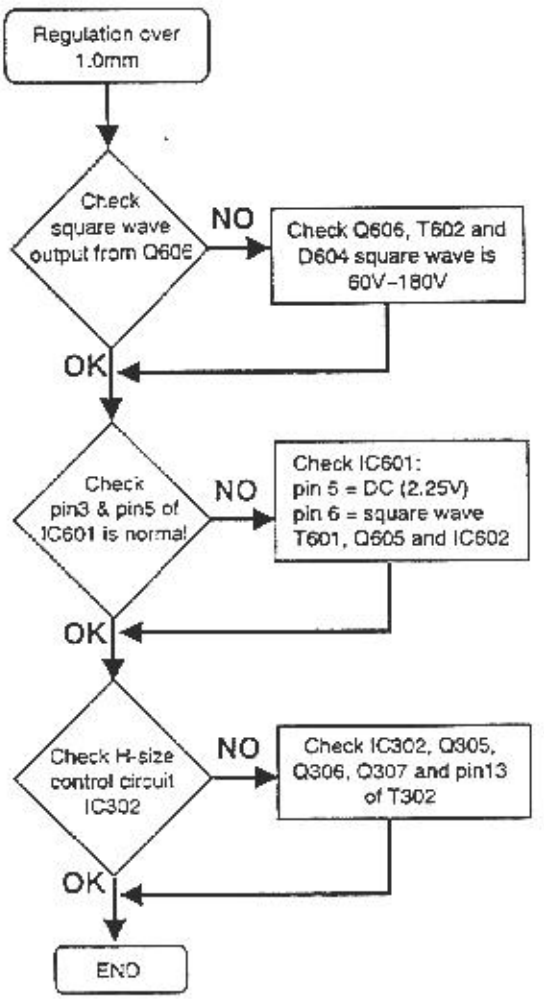
5.8. Misconvergence



5.9. Poor Regulation


Regulation over 1.0mm
Check square wave output from Q606
NO
Check Q606, T602 and D604 square wave is 60V~180V
OK
Check pin3 & pin5 of IC601 is normal
NO
Check IC601: pin 5 = DC (2.25V) pin 6 = square wave T601, Q605 and IC602
OK
Check H-size control circuit IC302
NO
Check IC302, Q305, Q306, Q307 and pin13 of T302
OK
END

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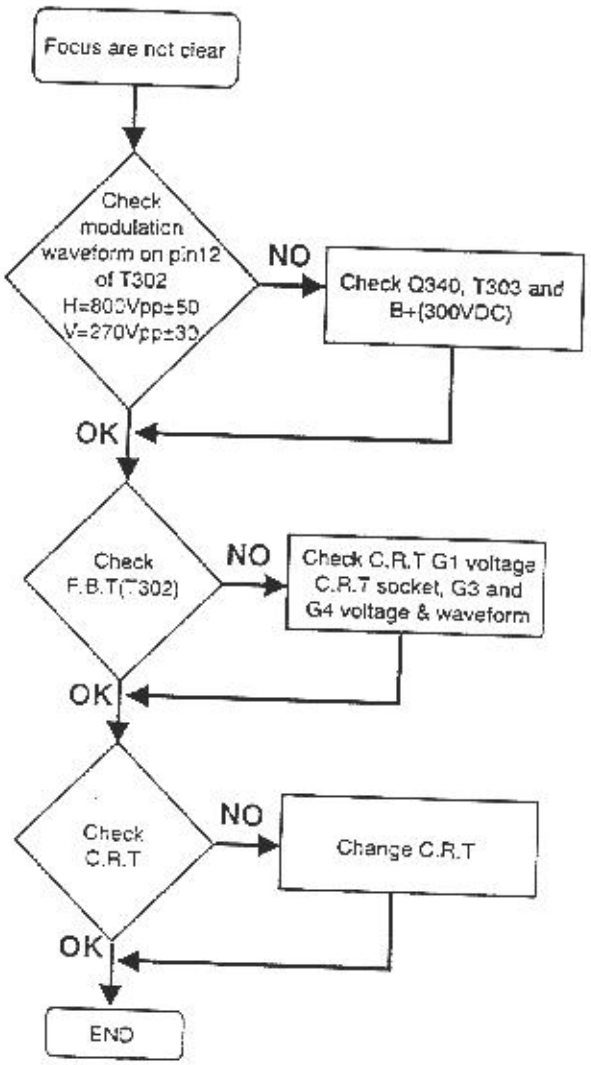
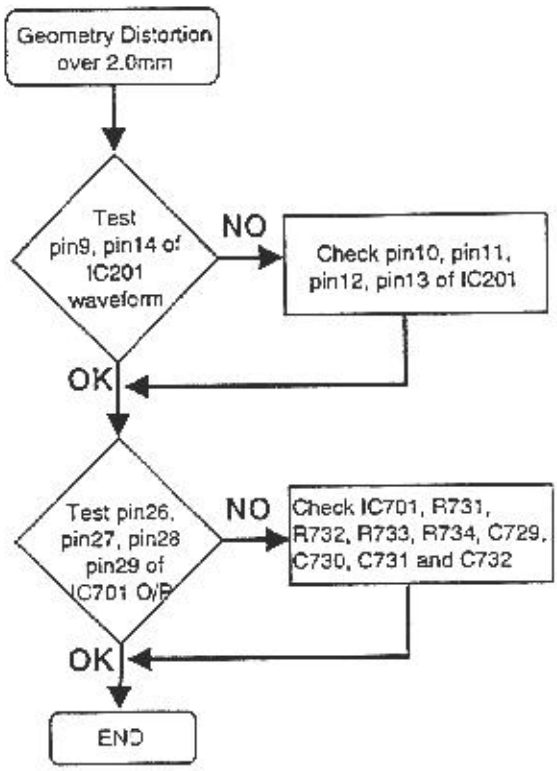
5.10. Poor Focus



5.11. Poor Geometry Distortion


Geometry Distortion over 2.0mm
Test pin9, pin14 of IC201 waveform
NO
Check pin10, pin11, pin12, pin13 of IC201
OK
Test pin26, pin27, pin28 pin29 of IC701 O/P
NO
Check IC701, R731, R732, R733, R734, C729, C730, C731 and C732
OK
END

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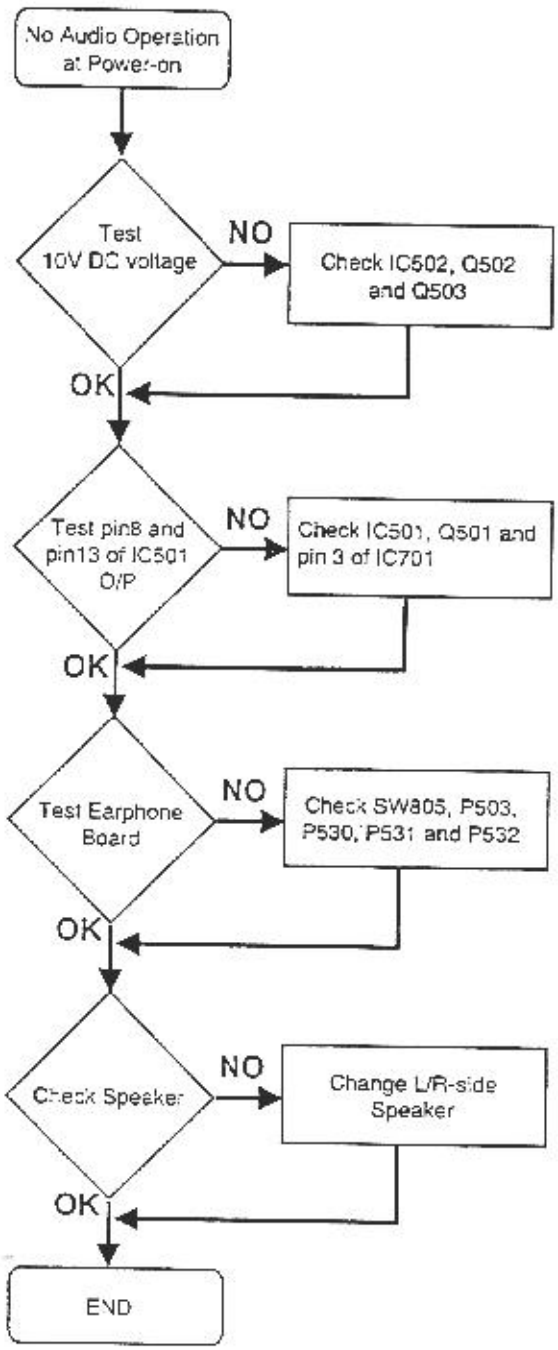
5.12. No Audio Amplifier



Section 6.
Printed Circuit Boards

6.1. Main Board 6-1
6.2. Neck Board 6-2
6.3. Control Board and Earphone Board 6-2
6.4. PCB Wiring Connection 6-3

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6.1. Main Board

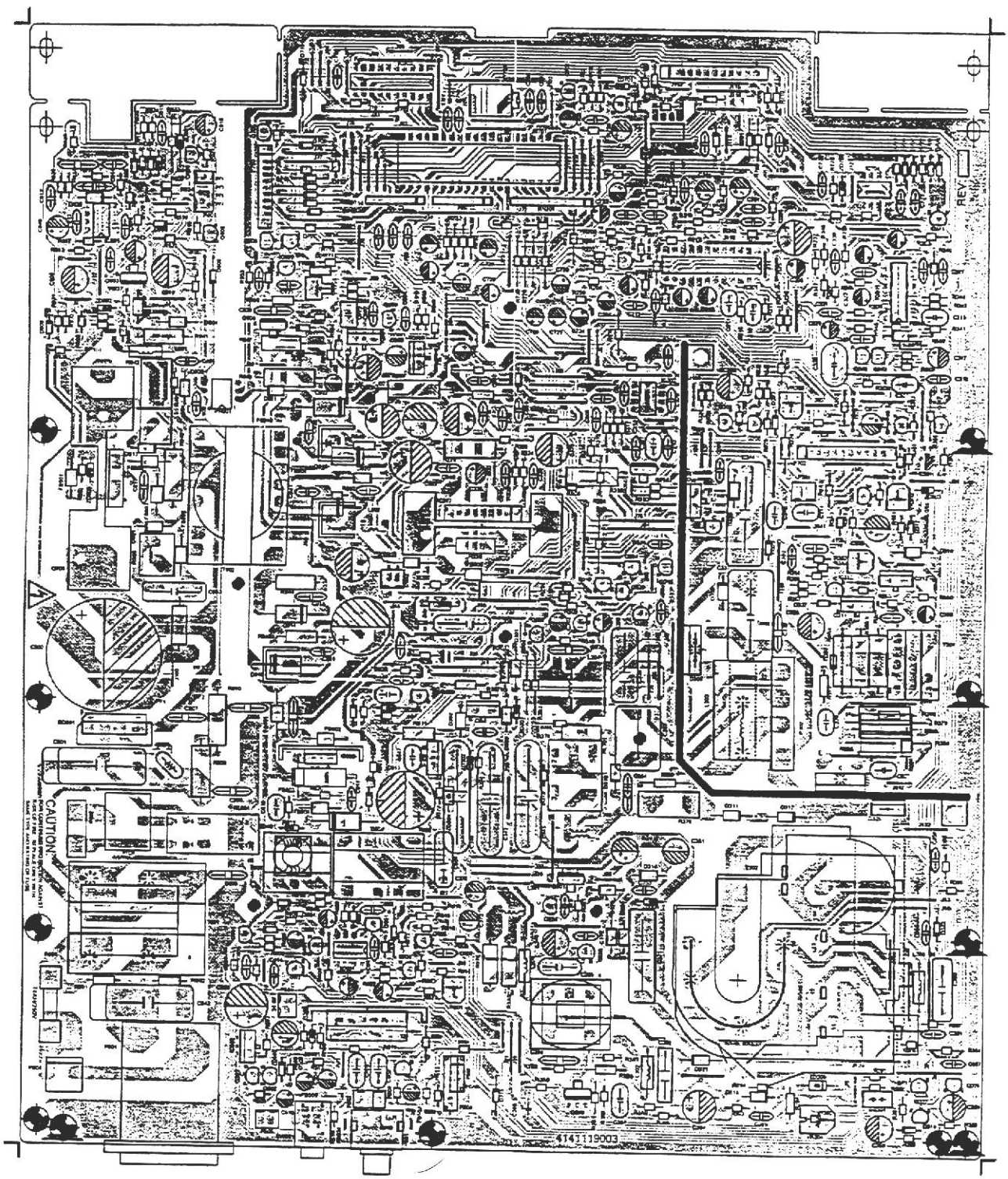

Figure 6-1 Main Board (Solder Side)

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6.2. Neck Board

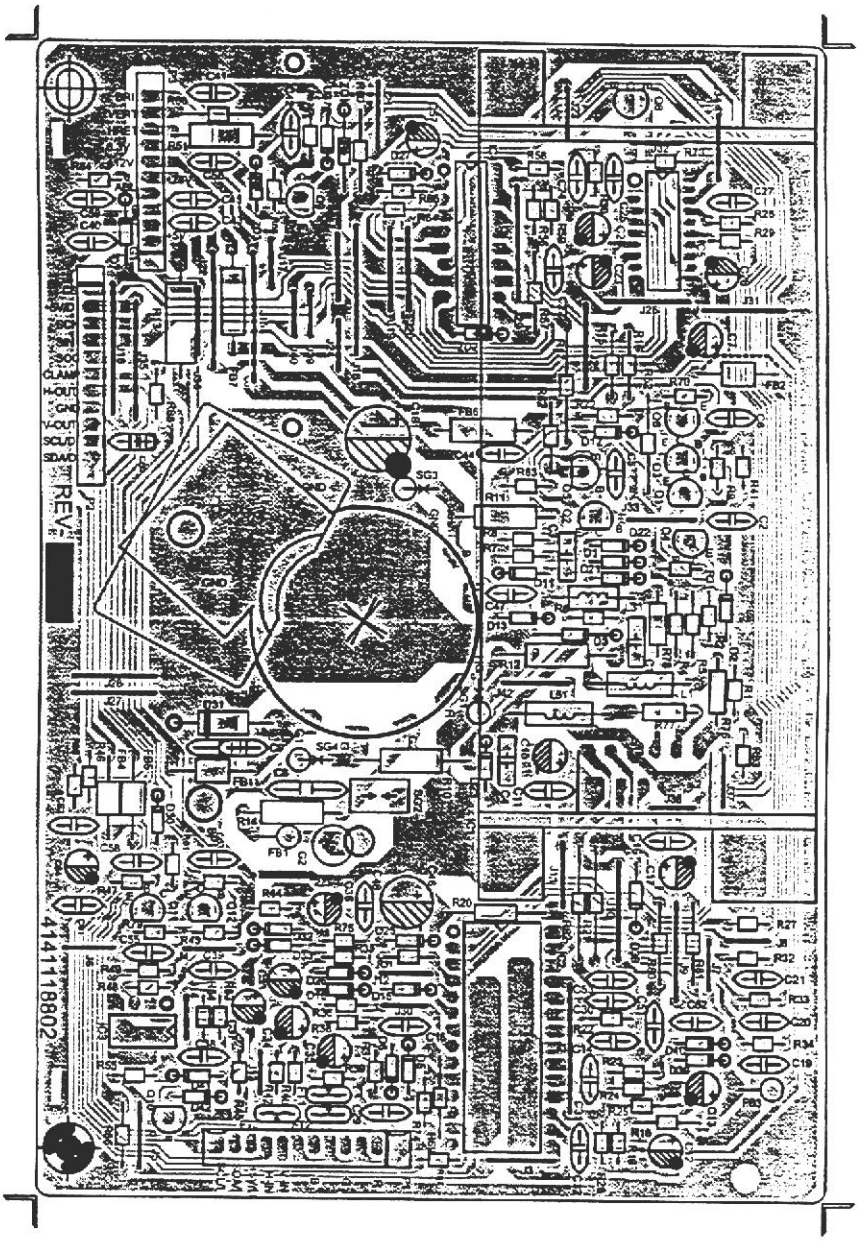

Figure 6-2 Neck Board (Solder Side)

6.3. Control Board & Earphone Board

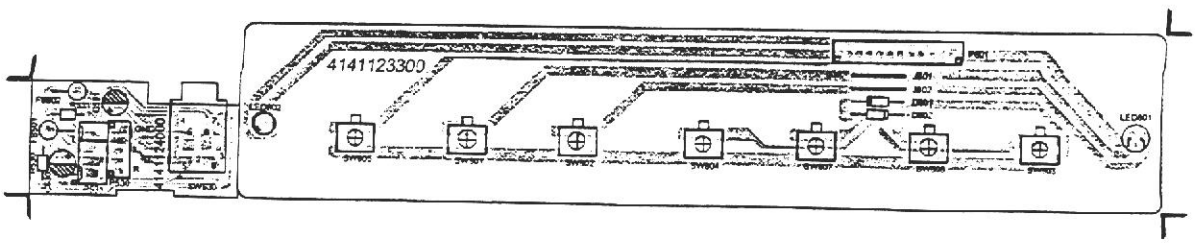

Figure 6-3 Control Board & Earphone Board(Solder Side)

6.4. PCB Wiring Connection

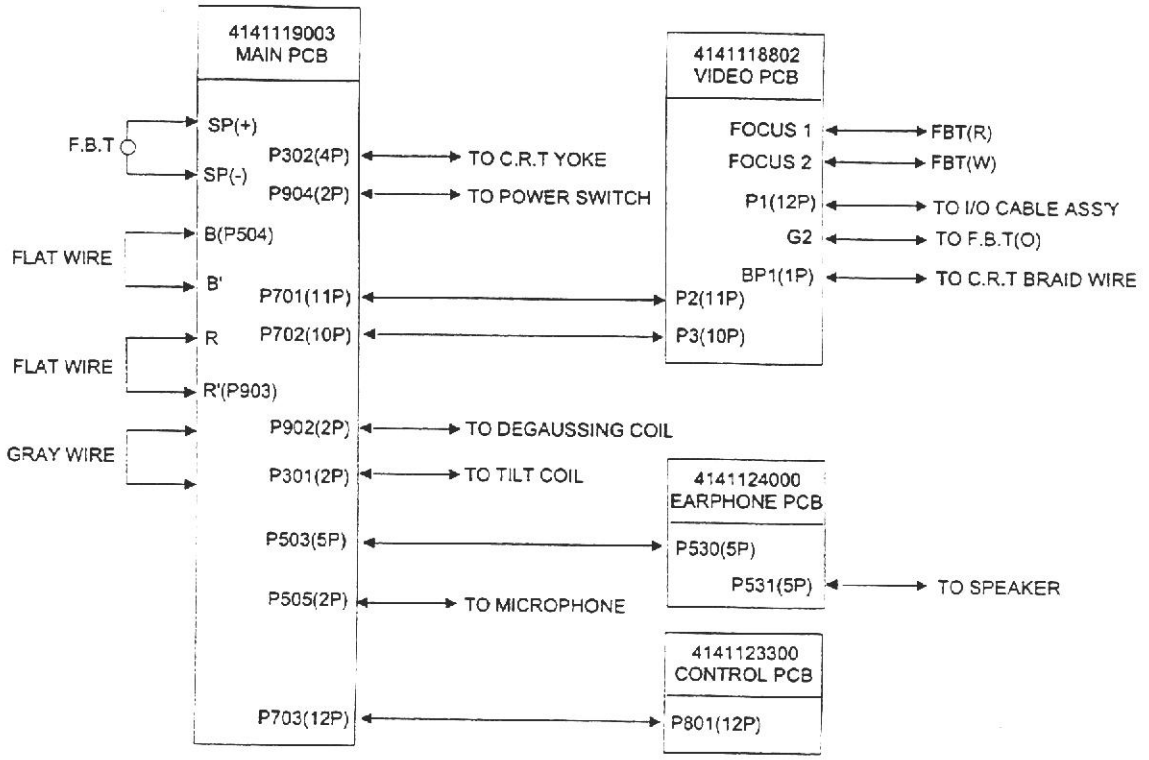

Figure 6-4 PCB Wiring Connection

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Section 7.
Schematic Diagrams

7.1. S/P/S Circuit Diagram 7-1
7.2. Neck Circuit Diagram 7-1
7.3. Deflection Circuit Diagram 7-1

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7.1. S/P/S Circuit Diagram

Please refer to the attached circuit diagram.

7.2. Neck Circuit Diagram

Please refer to the attached circuit diagram.

7.3. Deflection Circuit Diagram

Please refer to the attached circuit diagram.

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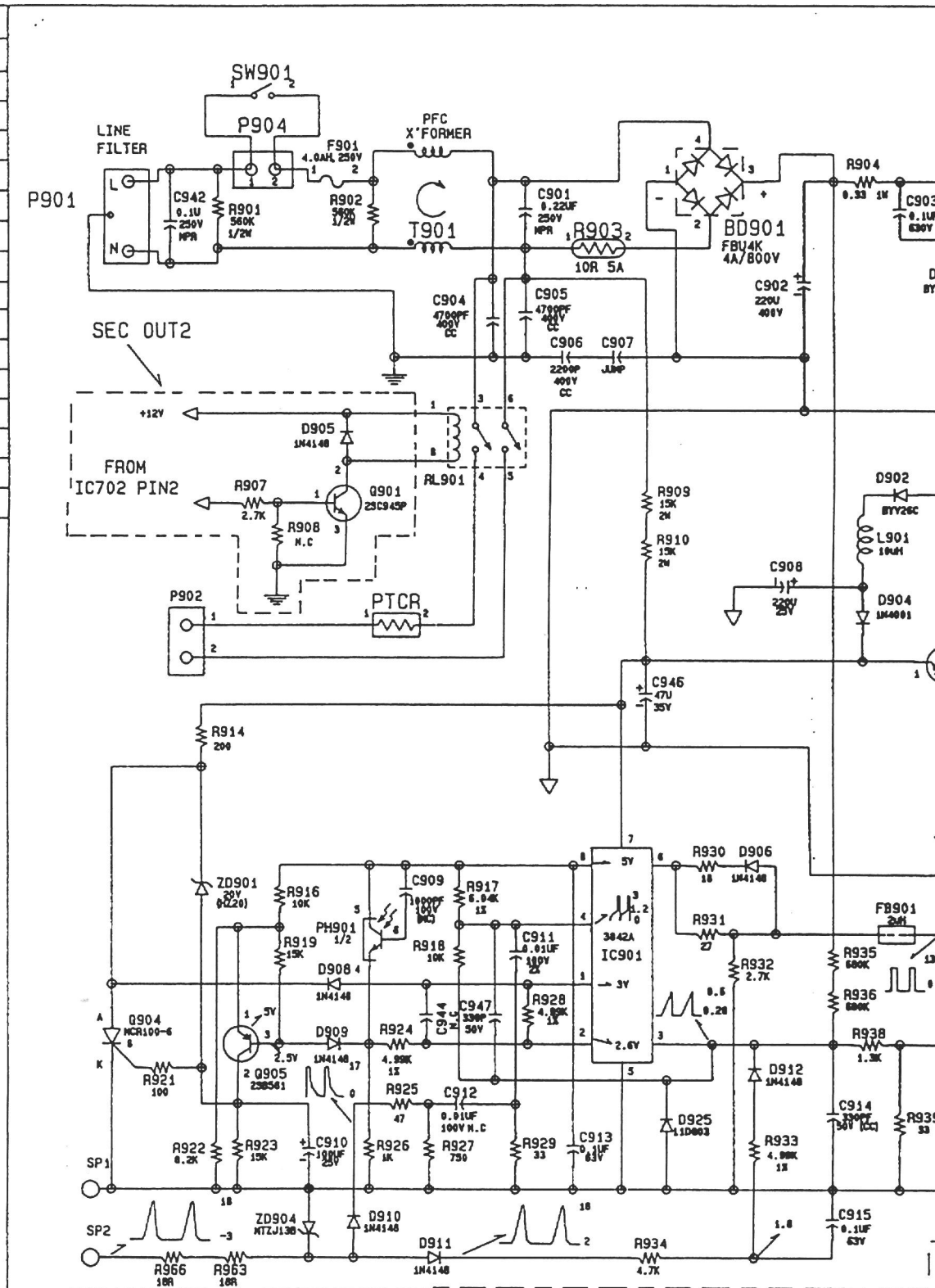
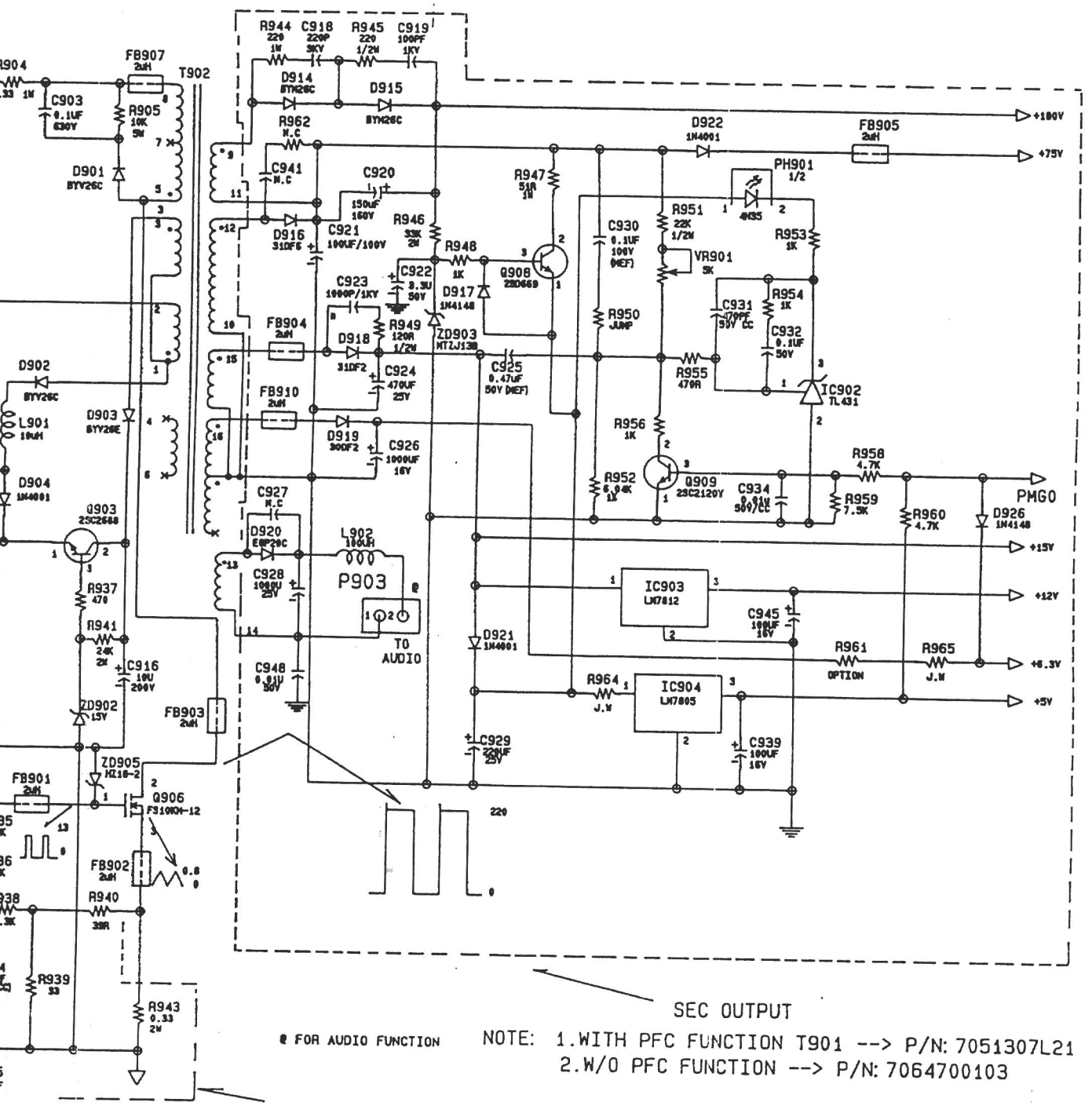
DATE	ECN/ECO NO.
06-02-'97	N-06029701EG





@ FOR AUDIO FUNCTION

NOTE: 1.WITH PFC FUNCTION T901 --> P/N: 7051307L21
2.W/O PFC FUNCTION --> P/N: 7064700103

PRI CTL CKT

CRT / NAME	MATSUSHITA	HITACHI
R961	2R/2W	3R/1W

DRAWING DATE	TOLERANCE		SCALE	UNIT
06-02-'97	DIM + -	ANGLE + -	/	MM
DRAWER	SHEET		DRAWING NAME	FILENAME
LIN	1 OF 1		S/P/S	SM7L3X3A
MODEL NO.:	ViewSonic Corporation			EA771

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